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14. ABSTRACT The primary objective of the SBPRRS is to recommend "a physical readiness test or tests that accurately predict Soldier performance of Warrior tasks and battle drills (WTBDs)." This report documents the key USAPHC activities and products completed during the 2012 – 2013 timeframe that were performed in support of the SBPRRS and the development of a new Army physical readiness test. Some materials prepared by other organizations (e.g., TRADOC) are included to provide relevant context. Other efforts conducted solely by collaborating organizations (e.g., TRADOC, USARIEM, or USUHS) are not included. For one of its SBPRRS tasks, the USAPHC has also published the associated Public Health Report (# PHR 12-02-0614) "Correlations between Physical Fitness Tests and Performance of Military Tasks: A Systematic Review and Meta-analyses", June 2014, DTIC accession # ADA607688 (public release).		
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Development of a New Army Standardized Physical Readiness Test

January 2012 through December 2013

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Public Health Report No. 12-01-0614
Development of a New Army Standardized Physical Readiness Test
January 2012 through December 2013

1 Summary

1.1 Overview

From 2012 through December 2013 the U.S. Army Public Health Command (USAPHC) supported the Army's initiative to develop a new Army Physical Readiness Test (APRT). The APRT is intended to replace the existing Army Physical Fitness Test (APFT). The APFT includes a timed 2-mile run, 2 minutes of sit-ups, and 2 minutes of push-ups. Despite its existence since 1980, and numerous studies over the decades since, the association of APFT scores to one's physical ability to conduct critical military tasks has not been scientifically validated. The Army has now ordered efforts to ensure scientifically-defensible physical testing standards, to include specialties previously excluded to women (Department of the Army-Headquarters (HQDA) 2012a, HQDA 2012b, HQDA 2013).

The USAPHC's 2012-2013 activities are part of a still-ongoing collaborative effort referred to as the Soldier Baseline Physical Readiness Requirements Study. The primary objective of this study is to determine baseline Soldier physical readiness requirements and to recommend "a physical readiness test or tests that accurately predict Soldier performance of Warrior tasks and battle drills (WTBDs)." (HQDA 2012b) The U.S. Army Training and Doctrine Command (TRADOC) is the designated lead organization for the comprehensive Army study. The U.S. Army Medical Command (MEDCOM) has been tasked to support the planning and execution of the study. MEDCOM support is provided through subject matter expertise (SME) from the USAPHC and the U.S. Army Research Institute of Environmental Medicine (USARIEM). Additionally, the Uniformed Services University of the Health Sciences (USUHS) and the Superintendent United State Military Academy (USMA) have provided SME support.

The USAPHC 2012-2013 activities enhance the scientific evidence necessary to establish a relevant and a validated physical readiness test to support the Army goal to develop a new physical readiness test. The Army-wide comprehensive Soldier Baseline Physical Readiness Requirements Study (SBPRRS) is ongoing, and additional products will build on the products to date.

1.2 Purpose

This report documents the key USAPHC activities and products completed during the 2012 – 2013 timeframe that have resulted from USAPHC responsibilities and tasks to support the development of a new Army physical readiness test. Some materials prepared by other organizations (e.g., TRADOC) are included to provide relevant context. Other efforts conducted solely by collaborating organizations (e.g., TRADOC, USARIEM, or USUHS) are not included.

1.3 Results

Table 1 summarizes the activities and products described in this report. While the activities are presented as sequential efforts over time, some efforts occurred concurrently. The USAPHC is continuing to conduct various efforts described (e.g., systematic review, field studies) and intends to publish additional analyses in the future to provide scientific evidence in support of U.S. Army efforts to develop new physical readiness and performance standards.

Table 1. 2012 - 2013 Activities for the Development of a new APRT

TIMEFRAME	ACTIVITY	IN THIS REPORT
	References	Appendix A
	History of U.S. Army Physical Fitness Testing	Section 4.2 Appendix B
	Preliminary review of impacts and validity of proposed APRT events	SECTION 5
January 2012	USAPHC reviewed selected proposed APRT events and associated impacts relative to injuries; prepared talking paper and white paper.	Appendix C
March-April 2012	TRADOC requested three groups of SMEs to evaluate the APRT that was to be implemented 1 October 2013 in order to advise decision-makers as to whether to implement the proposed 2012 APRT.	Appendix D
August 2012	HQDA organized a video teleconference with Army SMEs from TRADOC, USAPHC and USARIEM, to discuss plans to suspend implementation of proposed APRT pending a more comprehensive study.	Section 5 Appendix E
	Gender Analyses of APFT and APRT events	SECTION 6
September-October 2012	USAPHC analyzed gender-related score differences for APFT and pilot APRT events (presented and discussed during initial October conference).	Appendices F, G
October 2012	USAPHC participates in TRADOC initial planning conference at Ft. Eustis, VA, also attended by USARIEM, USUHS, and others.	Appendix H
	Study Plans and USAPHC Systematic Review	SECTION 7
November 2012	The TRADOC project lead presented study concept to the TRADOC Chief of Staff for approval – included five phases: first phase was a systematic literature review to be performed by USAPHC.	Appendix I
January–June 2013	USAPHC conducted preliminary assessment of Army-relevant tasks and initiated a Systematic Review of the scientific literature; provided interim findings of the review to TRADOC in June 2013.	Appendix J and K
	Identifying Key Warrior Tasks and Battle Drills (WTBDs)	SECTION 8
April 2013	USAPHC SMEs participated in a blue ribbon panel sponsored by the National Strength and Conditioning Association and American College of Sports Medicine to rank military tasks and associated fitness tests.	Section 8.2 Appendix L
May 2013	TRADOC planning conference focused on deconstruction of various WTBD to identify essential components of physical fitness required to perform the tasks.	Section 8.3 Appendix M
May – July 2013	USAPHC provided SME support to TRADOC focus groups at Ft Jackson, SC; Ft Benning, GA; and Ft Leonard Wood, MO to obtain feedback from Soldiers regarding physical demands of key WTBDs.	Section 8.4 Appendix N
June 2013	USAPHC provided SME support to initial TRADOC pilot evaluation of proposed field events to simulate key WTBDs (Fort Jackson, SC)	Section 8.5
August 2013	TRADOC presented In-Process Review (IPR) briefing to stakeholders	Section 8.5 Appendix O
	Fort Carson Investigative Field Study	SECTION 9
September 2013	USAPHC provided data collection and analysis support for the TRADOC field study at Fort Carson, CO where Soldiers performed a series of simulated tasks and associated events that represented major components of the essential WTBDs. [This report contains the TRADOC protocol for that field study, a description of the simulated field events and tasks, the ranked scoring of Soldiers perceptions of the physically-demanding tasks after their participation, and also results of the USAPHC analysis of the correlation of events, tasks, and physical variables.]	Section 9.1 and Appendix P Appendix Q Section 9.3 and Appendix R Section 9.4 and Appendix S
	Discussion and Conclusions	SECTION 10

2 References

See Appendix A for a complete list of reference information.

3 Authority

Under U.S. Army Regulation (AR) 40-5, Section 2-19, the USAPHC is responsible for providing support for Army preventive medicine activities, and to provide Army Commands (ACOMs) the epidemiological support necessary to address force health and readiness requirements. (Department of the Army (DA), 2007). For this study, the USAPHC- representing MEDCOM- is providing the SME support for the TRADOC Baseline Study by providing epidemiological support to better define the scientific relationship between physical fitness testing measurements and current military occupational task requirements as a means to better predict and prevent injuries to Army Soldiers. (HQDA 2012a, HQDA 2012b, HQDA 2013).

4 Introduction

4.1 Mission

The Army Institute of Public Health (AIPH) Injury Prevention Programs (IPP) mission is to identify injury causes or risk factors that can be used in evidence-based initiatives to prevent injuries. Specifically, the AIPH Injury Prevention Program seeks to identify scientific relationships between occupational, physiological, and environmental conditions and physical injuries amongst Army Soldiers through surveillance, epidemiological analysis, field studies, program evaluations, and systematic reviews. Performance on the APFT events has been a long standing measurement used in AIPH epidemiologic evaluations to assess the association between physical fitness and injuries. Defining the scientific relationship between physical fitness testing measurements and current military occupational task requirements is critical to understanding injury risk factors and identifying means to prevent injuries and thus improve overall Army readiness.

4.2 Background

U.S. Department of Defense (DoD) policy requires that “Individual Service members must possess the cardio-respiratory endurance, muscular strength and muscular endurance, together with desirable levels of body composition to successfully perform in accordance with their Service-specific mission and military specialty.” (DoD, 2004). The DoD policy does not define the specific tests or required thresholds for fitness measures; instead it indicates that such measures be tied to successful performance of Service-specific mission or specialty. Each Service establishes its own specific set of fitness tests and standards.

The U.S. Army has utilized various tests of physical fitness since as early as 1940 (See Appendix B). The current APFT was established in 1980 (DA, 2010). It includes a timed 2-mile run, 2 minutes of sit ups, and 2 minutes of push-ups. A Soldier’s scores for the APFT events are based on gender- and age-adjusted standards with a maximum score of 100 points on each event, combining to a maximum score of 300 (DA, 2009; DA, 2010; McCrary 2006). While the APFT has been shown to correspond to types of muscular and cardiovascular fitness (Knapik 1989; USACHPPM 2004, Sharp 1980), the basis for the APFT scoring standards is not entirely clear, in a 1998 inquiry by the U.S. Government Accounting Office (GAO); the Army Physical Fitness School indicated that modified scoring tables were to be implemented in 1999 (GAO, 1998). The revised standards’ minimum passing score was selected as the scores at which 8% of the males and 8% of

the females would fail the events. The maximum scores were the 90th percentile of the gender-based scores. Requirements were then “gradually reduced in 5-year increments as age increases.” (GAO 1998).

Though numerous studies of different tests and regression models have been performed over the years; the association the U.S. Army’s APFT events to military job task performance or overall readiness has never been scientifically validated (NRC 2006, Harman 2008, Leboeuf 2002, DoD 1999, GAO, 1998, Rayson 2000; Sharp 1980). Many national reports on this concern (NRC 2006, GAO 1998, IOM 1998, GAO 1996) indicate that the ability to meet the APFT standards may not adequately measure one’s physical capability to conduct critical military tasks, much less ensure military physical readiness in critical land combat operations. In addition, the DoD and Services have received increasing pressure to ensure scientifically defensible physical testing standards, in particular for military occupational specialties (MOS) which have previously excluded women (HQDA 2013; NRC 2006; GAO 1998; NATO 1997, DOD 1995).

The U.S. Army has evaluated potential new physical tests over the last decade and a 2002 seven-event APRT was proposed though not implemented (U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), 2002). Most recently, a 2012 five-event APRT was proposed. This proposed 2012 APRT included a 60-yard shuttle run, 1-minute (min) rower, standing long jump, 1-min push-up with no rest allowed and a 2-mile run for time. A separate “Army Combat Readiness Test” (ACRT) was also conceptually proposed as a gender-neutral obstacle course field test for assessing task-related physical capability prior to combat deployments. The TRADOC conducted two pilot test evaluations of the APRT and ACRT on samples of TRADOC and U.S. Army Forces Command (FORSCOM) Soldiers. The Injury Prevention Program, USAPHC analyzed TRADOC data from these pilot tests to compare the performance of men and women on each of the test events and to evaluate the correlation of the test events to the three events comprising the current APFT. In August 2012, the Army Chief of Staff (CSA) suspended plans to implement the proposed APRT and ACRT on 1 October 2012 after SME evaluations indicated that the new tests had not been validated. The use of the 2012 APRT as a replacement of the APFT was considered premature. The CSA directed the execution of a more comprehensive scientific study of physical assessments to identify test events that would “more accurately predict Soldier performance of Warrior Task and Battle Drills.” The study was also to provide a determination for the “threshold for success... for all Soldiers, independent of age or gender” (HQDA 2012a).

Many of USAPHC activities in 2013 were in support of the Soldier Baseline Physical Readiness Requirements Study (HQDA 2012a, HQDA 2012b, HQDA 2013). The USAPHC conducted these efforts in collaboration with TRADOC (including the TRADOC Initial Military Training-Center of Excellence (IMT-CoE), the U.S. Army Physical Fitness School (USAPFS), and the TRADOC Analyses Center (TRAC)) and SMEs from USARIEM, USUHS, and U.S. Military Academy (West Point). The study design established by TRADOC included five phases. The primary 2013 USAPHC activities included a Phase 1 systematic review of the scientific literature and technical and field support for aspects of Phase 2 (task even identification and selection). Phases 3-5 will involve efforts to evaluate specific tests and ultimately recommend to the VCSA a battery of physical assessments that a) encourages Soldiers to maintain health-related fitness and b) is associated with successful performance of the most physically demanding WTBDs.

5 Review of impacts and validity of 2012 APRT events, February- August 2012

5.1 Scope

Early in 2012, the USAPHC was requested to participate in discussions and provide input to the potential injury related impacts of proposed 2012 APRT and ACRT events. In August 2012, a video teleconference (VTC) organized by Army headquarters described responses of other SME reviews of the APRT. At that time, the USAPHC was made aware of plans to retain the existing APFT pending future tasks pertaining to a comprehensive physical requirements study.

5.2 Results

Appendix C contains the February 2012 USAPHC Talking Points and White Paper summarizing an assessment of injury concerns associated with various proposed events that had been suggested by the VCSA in media interview, including a 4-mile run and a 12-mile road march. In addition to citing increases in injuries with these events, USAPHC recommended that new tests should measure recognized components of health and operational fitness, be safe and easy to administer, and that training for the tests should enhance health-related fitness and minimize injury risk. A tiered approach for assessment of a base level of fitness and additional assessments according to occupational specialty and common military tasks was recommended.

Appendix D provides the USAPHC Executive Summary of the VTC held on August 2012. The discussion from the VTC was the prelude to the formal All Army Activities (ALARACT) 232/2012: Retention of the Army Physical Fitness Test and initiation of Baseline Soldier Physical Readiness Study (HQDA, 2012). This ALARACT formally cited the Baseline Soldier Physical Readiness Requirements study initiative and identified TRADOC as the lead.

Appendix E contains the external SME reviews of the validity of the proposed APRT and ACRT. The USAPHC was provided these reviews to help focus early discussions with the Study collaborators (i.e., TRADOC IMT-CoE, USARIEM, USUHS, USAPFS, and USMA). While the responses and recommendations were quite varied, there was general consensus that the proposed 2012 APRT could not be considered a 'validated' test and therefore was not considered an appropriate replacement to the existing APFT. While some concerns about the appropriateness or fairness of the proposed 2012 APRT could be equally stated about the current APFT, the SMEs recommended a more thorough, systematic, and scientific study that would culminate in recommending a validated battery of physical assessments that would encourage health related fitness and be associated with successful performance of physically demanding WTBDs.

6 Gender Analyses of APFT and APRT events, September - October 2012

6.1 Scope

The TRADOC IMT-CoE organized an initial planning conference at Fort Eustis in October 2012. For its role, the USAPHC had conducted epidemiological analyses of existing data sets that included male and female scores for APFT events as well as proposed APRT events for gender comparison.

6.2 Results

Appendix F and G provide the USAPHC analyses that were prepared for discussion at TRADOC's October 2012 initial planning conference. These analyses demonstrate the proportional differences of males and females that would pass the events in the current APFT and proposed APRT/ACRT using a "gender-neutral standard" with a 10% fail rate applied to the overall male and female scores combined. The 10% fail rate is similar to the existing 8% thresholds that were used to establish the score standards for the current APFT (GAO 1998). For the existing APFT pushup and 2 mile run events, a much higher percentage of females than -males who would fail. The sit ups, however, do not present a gender difference. Though more substantial gender differences are seen with the pilot APRT long jump and pull-up events, the gender impact is much lower for other proposed APRT events (e.g. rower, shuttle and 1/2-mile run (~800 yards)). This analysis demonstrates issues that will need to be considered when evaluating potential fitness assessments for the APRT if standards are to be gender-neutral. Certain events may be considered 'unfair' if they are not made gender specific. Other events, such as sit ups, rower, or short runs (shuttle, 1/2 mile) may be more "gender-neutral."

Appendix H contains the USAPHC EXSUM and briefing presented by the TRADOC lead at the initial planning conference. This presentation describes the overall context and planned goals of the Soldier Baseline Physical Readiness Requirements Study.

7 Systematic Review, November 2012 - June 2013

7.1 Scope

The TRADOC-lead presented the Baseline Soldier Physical Requirements Study concept brief to the CSA on 27 Nov 2012 (See Appendix I). The first phase of the study included a systematic review which was to be completed within 6 months after the initial study plan was approved. The systematic review was to be conducted by the USAPHC, with support from the USUHS. The purpose of the Systematic Review was to conduct a thorough review of the scientific and military literature to summarize the current state of the science as it pertains to the relationship(s) between performance of military tasks, physical fitness tests, and injuries. The review was also to include assessment of the differential effects of age and gender on these associations. The USAPHC was assigned lead for conducting the systematic review. Because the subject area of review was so broad, it was subdivided into four focused areas, each area being assigned to a team of SMEs at USAPHC and USUHS (see Table 2). A complete Systematic review, conducted in line with current scientific guidelines (Moher 2009, IOM 2011), would require well over a year of dedicated time and substantial resources from USAPHC and USUHS. Because the TRADOC timelines were constrained, an expedited review process was negotiated in order to provide interim findings to the TRADOC study team by June 2013. USAPHC and USUHS required additional time to complete the full systematic review and report the findings in a formal report and/or peer reviewed publication. The systematic review plan was finalized and approved in December 2012. The USAPHC was to provide a final briefing by June-July 2013.

Table 2. Systematic Review Subject Areas

Systematic Review Subject Areas		Assigned Personnel
1	Lab and Field Tests to Assess Physical Fitness	Tyson Grier, Morgan Anderson, Tim Bushman (USAPHC)
2	Comparison of Physical Fitness Tests to Job Task Performance	MAJ DeGroot and Veronique Hauschild (USAPHC)
3	Association of Task Performance and Injury	Keith Hauret and Elizabeth Clearfield (USAPHC)
4	Association of Components of Physical Fitness and Injury	Dr. Dianna Purvis, Dr. Pete Lisman, Dr. Sarah Delamotte, and Ms. Kaitlin Murphy (USUHS)

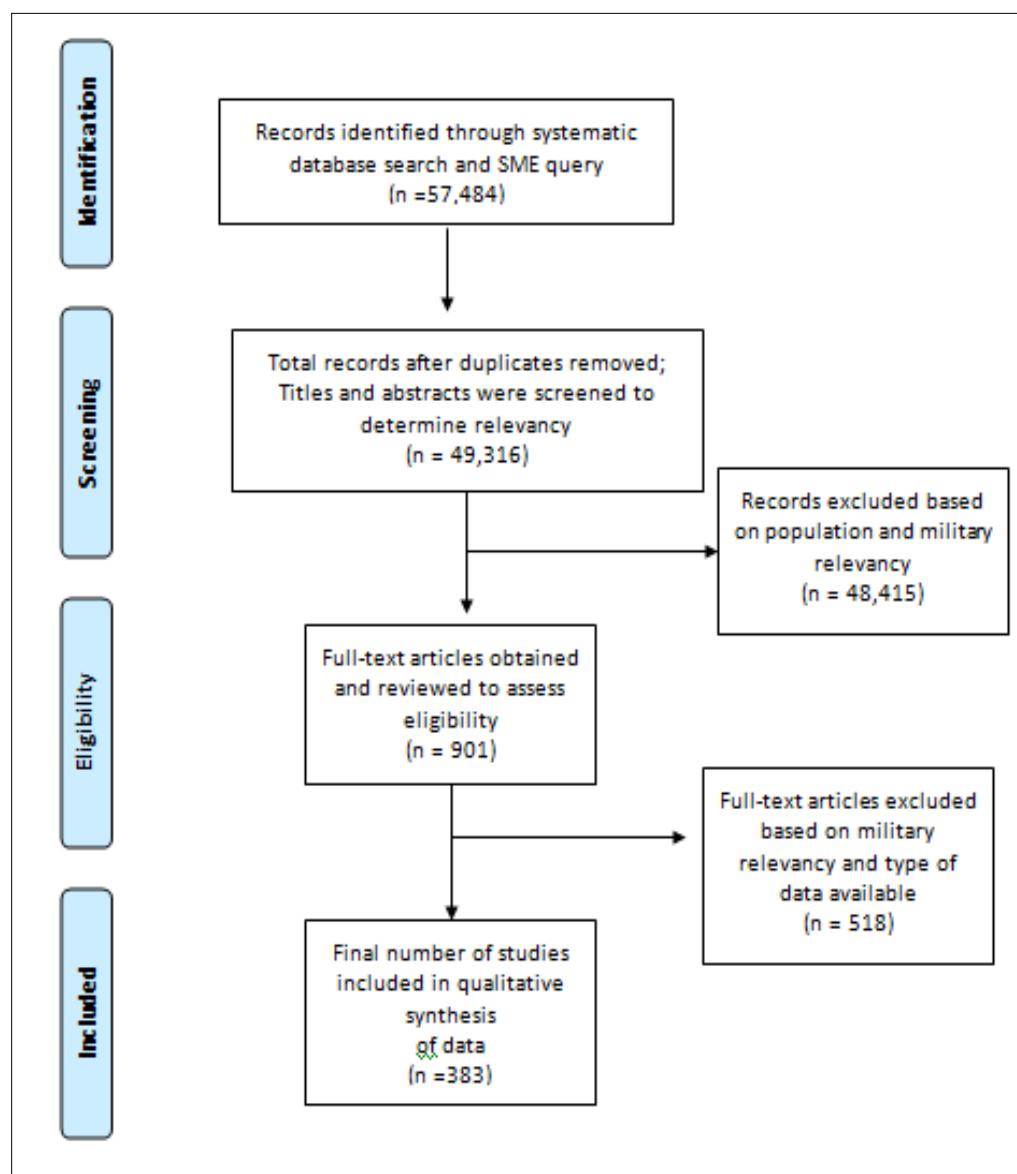
7.2 Method

The Systematic Review process was patterned after the PRISMA guidelines (Moher 2009; IOM 2011; Hemingway 2009) with scientifically supported adjustments for rapid reviews (Ganaan 2010). The databases used included: PubMed®, selected portions of EBSCOhost® (Academic Search Premier), Cochrane Methodology Register, MEDLINE® Biomedical Reference Collection, Comprehensive Nursing & Allied Health Collection, SportDiscus & SportDiscus Full text; CINAHL® & CINAHL Full Text, EMBASE®, and DTICEMBASE proved to be relatively difficult to apply search criteria but useful for specific article look-ups; it was also not completely accessible for free government access so was considered of limited additional benefit to this review. (PubMed is a registered trademark of the U.S. National Library of Medicine.) (EBSCOhost® is a registered trademark of EBSCO Publishing) (MEDLINE® is a registered trademark of the U.S. National Library of Medicine) (CINAHL® is a registered trademark of EBSCO Publishing) (EMBASE® is a registered trademark of Elsevier B.V.) Each subject area required determination on uniquely pertinent search terms but all areas used the following inclusion and exclusion criteria:

- **Document type.** Included were citable studies from military and non-military national and international sources; not included are editorials, presentations or abstracts, drafts or works-in-progress, or restricted or classified materials.
- **Dates.** Sources dated after 1970 up to the present 2013.
- **Language.** Only English language citations were used due to time and translation resource limitations.
- **Population characteristics.** Only human studies on healthy adults ($> 18 \leq 65$ years) were included. Studies on children, infants, elderly, or disabled/ill persons were excluded, as were animal, in vivo, or theoretical biomechanical or engineering studies.
- **Military Relevance.** Because the literature review included a variety of studies of occupational populations (e.g., firefighters police, athletes, and other occupations), it was critical provide a construct determining what might be relevant to the military and especially the physical demands of Army Soldiers. A preliminary review of selected military-focus documents (e.g., NATO 2009; DA 2009) was used to identify types of common and relevant military physical tasks. Appendix J summarizes the findings of the preliminary review that served as a basis for determining inclusion and exclusion of articles during the systematic review process.

7.3 Results

Figure 1 demonstrates the breadth of the systematic review process. From over 57,000 articles and reports initially identified as potentially relevant at the start of the review, less than 400 (for all four subject areas) were determined to provide the specific kind of quantified correlation data necessary for the epidemiological evaluations of pertinent associations. Appendix K provides the AIPH IPP and USUHS interim findings of the systemic review efforts as of June 2013 which were provided to TRADOC in a July 2013 briefing.



* These numbers include all four subject areas combined

Figure 1. Results* of Systematic Review to Identify Pertinent Studies

8 Identifying Key Warrior Tasks and Battle Drills, May – August 2013

8.1 Scope

During the 3rd QTR FY2013, the AIPH IPP team supported the following initiatives associated with the assessment of physically demanding WTBDs that are required of Soldiers, and design of field events to simulate these WTBDs.

8.2 External SME Panel Discussion on Military Tasks and Fitness Tests

On April 18-19 2013, USAPHC SMEs participated in the national Strength and Condition Associations Blue Ribbon Panel on Military Physical Readiness: Military Performance Testing. The panel members ranked common military tasks and then rated the relevance of each of the health-related fitness components required to perform each task. The panel members then broke into groups to identify and rank a list of field expedient tests that could be used to measure Soldiers' abilities to perform these tasks. A summary of the results of the rankings are provide in Appendix L.

8.3 Deconstruction of WTBDs

In May 2013, USAPHC personnel participated in a workshop with the other study's SME collaborators to deconstruct the most physically demanding WTBD into sub-tasks and then identify the components of physical fitness required to perform these sub-tasks. A presentation (Appendix M) from this workshop provides descriptions of the various tasks of interest.

8.4 Focus Groups to Identify Key Physical Requirements and WTBDs

Focus groups of TRADOC Soldiers were organized by the TRADOC study lead (IMT-CoE) at three locations (Fort Leonard Wood, Fort Benning, and Fort Jackson) in May - July 2013. The purpose was to further support the findings of the May workshop (per Section 8.3) with additional insights from the field about conditions under which WTBDs are conducted and what baseline standards that every Soldier, regardless of gender or MOS, should be able to meet without special skills or training. The sessions were confidential and only basic demographic information about the participants was obtained. Each focus group began with a discussion lead by IMT-CoE staff on problems with the current APFT and the need to connect physical fitness testing with WTBDs. USAPHC provided personnel to facilitate, record answers to questions, and prepare summaries of the sessions. Appendix N provides a summary of the focus groups results and an example of the questions and responses received (from Fort Jackson, July 2013).

8.5 Selection of Field Simulation Events to Represent WTBD

The previous efforts culminated in the selection of field events that simulated the most physical demanding WTBD yet were feasible for testing large numbers of Soldiers in a standardized field setting. TRADOC's August 2013 in progress review (IPR) presentation (Appendix O) describes the basis for recommended field test events. These field simulations were first evaluated during a pilot field site visit at Fort Jackson later that month on 21-30 August 2013. The USAPHC supported this pilot test with a representative from both the Injury Prevention Program and the Ergonomics Program. Based on observations at Fort Jackson, some modifications to the field events were made prior to the official field study planned for Fort Carson, CO.

9 Fort Carson Investigative Field Study - September 16-26, 2013

9.1 Scope

The TRADOC field study at Fort Carson was designed to evaluate the feasibility of conducting the field simulations of the physically demanding WTBDs and common military tasks that were pilot-tested at Fort Jackson. The Army Human Research Protection Office (AHRPO) did an expedited review of, and approved, the study plan (see Appendix P). Relevant for this review, the study was operationally-directed, Soldier participation was voluntary, and personally identifiable information was not used to identify participants. To evaluate Soldier performance on the task simulations, an obstacle-type course was constructed. Stations on the course simulated 4 military tasks that were represented by 11 individual events. Table 3 describes the selected military tasks and the Fort Carson field events used to simulate those tasks. Appendix Q provides a detailed description of the field events and equipment loads.

Table 3. Fort Carson Tasks and Associated Individual Events

Task Name	Basis for Task	Field events to simulate (see Appendix Q for details)
Prepare Fighting Position	Common Soldier Task ^a	Bucket Fill Sandbag Stack
Move Over Under (around) and Through ("MOUT")	Elements of Key Warrior tasks ("Move" and "Survive")	Crawl and Ruck Sack move Balance Beam High Walls (wall gauntlet)
Perform Combatives	Elements of Key Warrior tasks ^b ("Move" and Survive"; Elements of Battle Drills (e.g., "react to contact", "react to indirect fire") ^c)	Tire Flip Skedko Pull Sandbag Toss Trashcan Spin
Casualty Evacuation	Battle Drills (e.g., "perform combat casualty care") ^b	Extricate Casualty Casualty Drag

^a DA, 2011
^b See Appendix O

Two hundred and seventy Soldiers (15% female) volunteered to participate. Volunteers were tested in six groups (three groups each for 2 weeks). All volunteers were given an opportunity to familiarize themselves with individual events on the day prior to the official start of the test study. For the test study, Soldiers times for tasks and events were measured on 3 consecutive days. On test Day 1, Soldiers wore only the basic Army Combat Uniform (ACU), and were first timed for each individual event completed in random order. Time to rest was allowed between events and no overall course time was measured. Next, Soldiers went through the tasks and events in the established sequence of the obstacle course. Time to rest was allowed between events and no overall course time was measured. On Day 2 and Day 3, Soldiers were timed as they executed each event sequentially through the course. On Day 2, they wore the ACU and additional fighting gear ("Fighting Load") to perform the tasks. On Day 3, they also completed a 10-kilometer (km) (6.2 mile) road march wearing their sustainment load, and then completed the series of field events wearing their Fighting Load. Each day as Soldiers finished the course, a study team member asked each Soldier to identify the three most physically demanding events and recorded these responses for later analysis. On Day 3, Soldiers completed a brief survey regarding their experience in performing the simulated WTBDs.

The USAPHC provided on-site personnel to assist with daily data collection and entered all data into databases for analyses. The data collected included gender, body weight, height, and self-reported AFPT scores, daily times for Soldiers to complete each of the events/tasks, overall times to complete the course, Soldiers' daily responses about the most physically demanding events, and the survey responses from Day 3. The data analysis by the AIPH IPP team included a summary of Soldiers rankings of the most physically demanding events and tasks, and an examination of the correlations among the different field events, correlations of Soldier APFT performance and the field events, and correlations of the road march timed performance and the field events.

9.2 Ranked Scoring of Difficult Tasks

After completing the sequential events and tasks each day, Soldiers were asked to rank the three most physically demanding events for that day. Some Soldiers listed only one or two events, rather than three, on a given day. Therefore, the top ranked event for each day was considered most informative. Rankings for all groups over the 2 weeks were tallied together and percentages of ranks for individual events, as well as composite (task) events, were calculated for each of the 3 test days. These percentages provide a basic descriptive assessment of Soldiers' perceptions of these tasks. Anecdotal comments were documented to provide additional insights as to difficulty of performing the various events. Table 4 summarizes results of the composite and individual events and comments. Appendix R includes the detailed daily rankings of perceived most difficult tasks.

- The Perform Combatives task was consistently identified as the most difficult and physically demanding. This task was comprised of four individual events of which the Skedco Pull was consistently identified as the most physically difficult. The next most difficult ranked task was the Casualty Evacuation, which was represented primarily by the Casualty Drag event. The Skedco Pull and Casualty Drag both measured a Soldier's physical capability to drag an injured Soldier some distance, and thus may be considered duplicative test events.
- While trends in ranked scores were similar each day, some notable changes occurred:
 - The Prepare Fighting Position task (specifically the Sandbag Stack event) was ranked as most difficult by 35% of Soldiers on Day 3 after the Road March, as compared to only 15% and 20% on Days 1 and 2.
 - Soldiers reported all events seemed less difficult by Day 3 despite overall fatigue. From day to day, there may have been a task familiarization effect, since many Soldiers specifically stated that previously difficult events such as Skedco Pull, Trashcan Spin, and Casualty Drag actually seemed easier by Day 3 due to their familiarization with the task.
- Across tasks, fatigue was not always the reason given for "difficulty."
 - More problematic were environmental conditions (e.g., on Day 1 wet sand made the sand bags heavier; wet ground made it difficult to get good footing for the Skedco Pull, and Trashcan Spin; and equipment hindrance. Specifically, the body armor and ammo pouch worn on chest was in the way during Sandbag Stack of the Prepare Fighting Position Task, and was also in the way for shorter persons during the High Walls/Wall Gauntlet of the MOUT task. For some Soldiers, the slung weapon was in the way especially for certain events such as Trashcan Spin.
 - On the other hand, some of same factors were noted as reasons that certain tasks/events became easier. For example, some Soldiers indicated the Low/HighCrawl, Skedco Pull, and

Trashcan Spin were easier on wet ground. Some Soldiers with shorter stature noted that addition of the fighting load made Skedco Pull seem easier.

- On Day 3, some Soldiers noted that the Road March was difficult due to blisters and discomfort from the boots.
- Finally, while rankings from females were not gathered separately for analyses, anecdotally it appeared that concerns cited by some women were due more to their shorter/smaller stature (height and weight). Some of the same concerns were reported by shorter men. Taller/larger women did not have the same problems. Thus, the equipment issue described above appears to be more of a problem for 'shorter Soldiers' as opposed to being gender-specific. Other specific anecdotal comments are at the end of Table 4.

Table 4. Top Ranked Most Physically Difficult Field Events

Soldier Tasks ^{a-c} and Associated Events	Day 1 ACU Only	Day 2 Fighting Load	Day 3 Fighting Load, After 6.2 mile Road March
Prepare Fighting Position^a	15%	20%	35%
Bucket Fill	3%	2%	4%
Sandbag Stack	12%	18%	30%
Move Over-Under- Around- Through (Move O-U-A-T)^b	6%	19%	14%
Crawl and Rucksack Move	1%	4%	3%
Balance Beam	0%	0%	0%
High walls (wall gauntlet)	5%	15%	11%
Perform Combatives^{b, c}	56%	46%	51%
Tire Flip	8%	13%	13%
Skedko Pull	31%	23%	33%
Sandbag Throw	4%	2%	1%
Trash Can Spin	12%	9%	4%
Casualty Evacuation	23%	15%	20%
Casulty Drag (mannequin)	23%	15%	20%
Ruck March*			15%

NOTES: ^{a-c} are bolded as they represent the tasks, while non-bolded are associated events

^a Specified as a "Common Soldier Task", Soldier Training Publication (STP) 21-1-SMCT *Soldiers Manual of Common Tasks* (May 2011)

^b Represent elements of key "Warrior Tasks" [e.g., 'Move'(perform individual movement technique), 'Survive'(react to man-to-man contact)]

^c Represent elements of "Battle Drills" (e.g., 'react to contact', 'perform combat casualty care', 'react to indirect fire',)

Anecdotal Soldier comments regarding compliant/concerns for various events:

Bucket Fill: Too many buckets to fill (too long of an event); wet sand made it much more difficult; event was very hard on back

Sandbag stack: Too many bags to fill (too long of an event); equipment (ammo pouch) was in way of lifting (especially noted by shorter persons); sand bags much heavier when wet

Ruck sack move: least difficult (physically demanding) event, but crawling on wet ground (grass and dirt) was easier than when ground was dry; event was more difficult with gear, after road march with tired legs; equipment (ammo pouch) got in the way

Balance beam: Not difficult, but some commented that this was NOT the correct technique for carrying the M249 SAW.

Tire flip: Event became easier with improved technique by Day 3; but lower extremity fatigue after the road march was a factor; caused pain in the back for some Soldiers.

Skedco Pull: Majority felt this was most the physically demanding event, but it was easier for many when grass was wet, even though bags inside were heavier when wet; some persons (shorter, lower weight) indicated the event was easier when wearing more gear (Fighting Load) and more so by Day 3 (due to load and technique)

Trash can spin: Can was heavier when wet; many said it was much easier by the last day (sand was drier, but also they had learned 'technique'); several felt that trash can rotation event was a strange, poorly designed 'test' and was hard on the back.

Casualty Drag: Many considered this to be more physically demanding than the Skedco Pull, but noted it may seem especially hard because this event was at very end of course; slippery ground made it harder to get footing; many said the event was easier on last day (technique/more practiced)

Road March: Not intended to be a ranked event, as only on Day 3, but some said it was the hardest event that day – not necessarily "physically demanding" but physically difficult e.g., blisters were a common reason (from boots and weight); some stated they thought 10 km was too long distance.

9.3 Correlation Analyses

Obstacle course times were collected individually for each event on the first day and as continuous time stamps on the second and third days of the study. The continuous times were broken into individual event times by taking the difference between consecutive events. All event times were converted into fractions of minutes. Additional Soldier data were collected by study staff (i.e., height, weight, and self-reported most recent APFT results. Body mass index (BMI) was calculated as a Soldier's weight in kilograms divided by the Soldier's height in meters squared. SPSS version 19 (IBM) was used to calculate Pearson correlation coefficients for the variables of interest.

Bivariate correlation tables with a two-sided test of statistical significance were constructed.

Though it is recognized that various limitations in study design prevent substantial conclusions to be drawn from the data collected, Pearson correlation matrices were prepared for the following three types of data correlations:

- Correlation of the individual events and tasks (measured as "time to complete events/tasks") and physical variables (weight, height, BMI and self-reported APFT scores). Correlation matrices were prepared separately for female and male Soldiers, for each day.
- Correlation within the individual events and tasks (measured as "time to complete event/task"). Matrices were prepared using all available data and not separated by gender.
- Road March (only conducted on Day 3) as correlated to the physical variables and APFT scores, and other field events and tasks

Appendix S includes the correlation matrices of the resulting correlation values. Though limited interpretation of the correlations can be drawn, general observations and conclusions are presented below. To summarize data, statistically significant Pearson correlation (r) values greater than 0.4 (for positive correlations) and less than -0.4 (for negative correlations) were considered noteworthy. This criterion was selected due to the expected variation and confounding in these types of associations. Correlation values above 0.4 or below -0.4 were grouped in categories of Very high (≥ 0.7 or ≤ -0.7); High (≥ 0.5 to < 0.7 or ≤ -0.5 to > -0.7); and Moderate (≥ 0.4 to 0.5 (≥ -0.4 to ≤ -0.5)) for general ranking and discussion purposes.

9.3.1 Task and Event Correlations to Soldiers' Physical Variables

Table 5 provides a summary of the correlations presented in Appendix S, Tables S1-S6.

- For females, height and weight had the strongest correlation to all tasks except for the MOUT. Specific events such as the Sandbag Stack and Skedco Pull were highly correlated with height and weight in a negative relationship: as height and weight decreased, time to complete

these events increased. BMI had lower correlations to both tasks and events. APFT variables had low correlations to all tasks, with some moderate correlation between Sit Ups and the Tire Flip and Casualty Drag events.

- For males, no physical variables (weight, height, BMI, or APFT event/scores) had any noteworthy correlations with any events or Tasks (all r values were Low, <0.4 or >-0.4

Table 5. Summary of Task and Event Correlations to Soldiers' Physical Variables

FEMALES	Weight	High correlation with Prepare Fighting Position task time for Day 1 and 2, and Moderate for Day 3 (Fighting Load after Road March). High correlation with Sandbag Stack event (part of the Prepare Fighting Position Task) for Days 2 and 3, and Moderate for Day 1. Moderate correlation of Perform Combatives Task on Day 1 in ACU; Low correlation for this task for Days 2-3 when in Fighting Load. However, there was a High correlation with the Skedko Pull on all 3 days. Moderate correlation with Casualty Evacuation Task on Day 3, Low on Days 2 and 3. Low and non-statistically significant correlation to MOUT task on all days.
	Height	Moderate correlation with Prepare Fighting Position task for all days Within this task, high correlation to Sandbag Stack event for all days High correlation of Perform Combatives Task on Day 1 only, Moderate on Day 3; Low on Day 2. High correlation for Skedko Pull event time on Days 1 and 3, Moderate on Day 2. High correlation to Casualty Evacuation Task on Day 1, Moderate on Days 2 and 3. Moderate correlation due to Extraction event and not Drag.
	BMI	Moderate correlation with time to complete Prepare Fighting Position task. Low correlation with all other Tasks and individual events.
	APFT	Low correlation to all Tasks on all days. Moderate correlation to Tire Flip and Casualty Drag events on Day 3 (Fight Load with Road March); Low correlation to all other individual events, and none of these correlations were statistically significant*
	Sit Ups	Low Correlation to all tasks; none were statistically significant Moderate correlation with Tire Flip and Casualty Drag events on Day 3 (Fight Load with Road March); Low correlation to all other individual events except for a moderate positive correlation between number of sit-up reps and the amount of time it took for a Soldier to reach the vehicle door where the casualty dummy was positioned.
	Push ups	All correlations were Low and not statistically significant, except for a moderate negative correlation between push-up score and balance beam time on Day 2.
	Run	All correlations were Low, except for Moderate negative correlation between APFT Run Time and time to complete the Casualty Drag event on Day 3.

Table 5. Summary of Task and Event Correlations to Soldiers' Physical Variables (continued)

MALES	No noteworthy (all Low <0.4 or >-0.4) correlation between weight, height, BMI, or APFT related variables or associated Tasks, regardless of ACU/Fighting Load, or prior completion of a 10-km Road March.
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Notes:

(-) Correlations are negative (e.g., higher weight/height/BMI/ Scores/Reps= less time in Task or event)

* One event included in analyses was referred to as the “vehicle door” as part of Casualty Evacuation; all correlations were Low for this event except with Female sit up reps – which is a moderate positive correlations. Since it is not clear that the same activity was timed for this event for all days it is not considered a key event or finding

9.3.2 Task to Task and Individual Event Correlations

Table 6 provides a summary of the correlations presented in Appendix S, Tables S7-S10.

- On Day 3, the strength of correlation between all Tasks is High to Very High.
- MOUT had no noteworthy correlation to any other tasks on Day 1; however, the highest task-to-task correlations are between MOUT and Performing Combative Tasks on Day 2 and Day 3.
- Of all individual events, the Sandbag Stack, which was part of the Prepare Fight Position task, had the strongest overall correlation to all tasks. This was particularly notable on the day Soldiers complete the obstacle course in their Fighting Load (Day 2): the correlations of this event to other tasks are High or Very High.
- The Skedco Pull was the next most highly correlated individual event (each day) to other tasks, followed by Casualty Drag. These events tend to have High to Very High correlations to each other as well as several other events.

9.3.3 Road March Correlations to Physical Variables, Tasks, and Events

The full correlation matrix is for Road March correlations are presented in Appendix S, Tables S11 and S12.

- Taking into account male and female Soldiers together, time to complete the 10-km Road March was highly correlated with Soldier's height, weight or BMI.
- The only noteworthy correlation was between Road March time and the self-reported 2-mile run time, and this was a positive low correlation. Those with faster 2-mile run times also had faster Road March times.
- Including the entire cohort in the analysis, Road March time had a low correlation only with the Fighting Position task time, in particular, the Sandbag Stack event. Separating the analysis by gender, the correlations between the Road March time and the time to complete these events was low (not noteworthy).

Table 6. Task to Task Correlation Results

Day 1/Soldiers Wearing ACU, Events Performed in Random Order				
	Fight Pos	MOUT	Combat	CasEvac
Fight Pos	1	0.32	0.60	0.50
MOUT		1	0.39	.31
Combat			1	0.66
CasEvac				1
Day 1/Soldiers Wearing ACU, Events Performed in Sequence				
	Fight Pos	MOUT	Combat	CasEvac
Fight Pos	1	0.22	0.66	0.68
MOUT		1	0.43	0.66
Combat			1	0.59
CasEvac				1
Day 2/Soldiers Wearing Fighting Load, Events Performed in Sequence				
	Fight Pos	MOUT	Combat	CasEvac
Fight Pos	1	0.72	0.73	0.68
MOUT		1	0.82	0.66
Combat			1	0.63
CasEvac				1
Day 3/Soldiers Wearing Fighting Load, Events Performed in Sequence After 10-km Road March				
	Fight Pos	MOUT	Combat	CasEvac
Fight Pos	1	0.708	0.69	0.619
MOUT		1	0.75	0.659
Combat			1	.723
CasEvac				1

Legend:
 Fight Pos= Prepare Fighting Position
 Combat = Perform Combatives
 CasEvac = Casualty Evacuation

NOTE: Correlations greater than 0.4 (for positive correlations) and less than -0.4 (for negative correlations) were considered noteworthy and are bolded. Correlations were grouped in categories of Very high (≥ 0.7 or ≤ -0.7); High (≥ 0.5 to < 0.7 or ≤ -0.5 to > -0.7); and Moderate (≥ 0.4 to 0.5 (≥ -0.4 to ≤ -0.5)). Darker shading indicated strongest correlations. The changes in strength of these correlations should not be overly interpreted. This data merely demonstrates some consistent correlations between certain tasks over days. The significance in changes in correlation strength may not be significant or could be due to a variety of factors (e.g., learning technique, equipment, fatigue, changes in motivation) that were not measured here.

9.3.4 Conclusions From Correlation Data

Pearson correlation coefficients tell us if there is a linear relationship between two variables; in this study we looked at both 1) the relationship between time to complete events/tasks and Soldier variables such as height, weight, BMI and fitness variables and 2) the relationship between time to complete one event/task with the time to complete all other events/tasks.

The first set of correlations gives us insight on how Soldiers with different body types and fitness levels performed on this obstacle course, and how they potentially would perform, in terms of time to completion, on a future APRT that incorporated some of these events. For men, none of the body or fitness characteristics had notable correlations with time to complete the various events and task, and for women, height and weight had negative correlations events. For the women in this study, those who were shorter and those who were heavier generally took a longer time to complete events and tasks.

The second set of correlations of each task and event with each other task and event provides information about how similar or dissimilar the times were to complete the events. A high correlation indicates that for the Soldiers in the study, the time to complete one event was similar to the time to complete another event. Combining these correlation coefficients with anecdotal evidence (e.g., from the Soldiers rankings and comments described in Section 9.2), it may follow that tasks or events that are highly correlated may have incorporated similar physical skills or exertion. However, it should be noted that if for one event a Soldier was working hard for 4 minutes and another event that Soldier rested for 3 minutes and worked for 1 minute, a high correlation would still be noted. Quantified data was not collected to ascertain this level of individual variation.

We saw changes in the correlations of certain tasks (in particular, the MOUT task) from Day 1, when the Soldier wore only ACUs to Day 2 and 3, in that correlation coefficients were notably higher on Day 2 and 3. While the reason for this change could be related to or influenced by several possible factors (e.g., learning technique, fatigue, motivation, and/or equipment), this correlation analyses cannot be used to provide a reason for this change, as we did not collect data on learning technique, motivation, or effect of the equipment. Fatigue data was collected in the form of asking the Soldier their rated perceived exertion, but these data were not incorporated into the correlation analysis.

10 Discussion and Next Steps

This PHR is intended to serve as a foundation reference for future USAPHC, TRADOC, and Army efforts to establish a new Army physical readiness test. The information provides an understanding that though the existing AFPT is not a validated test, additional work and documentation is necessary to provide clear justification of a new test. Some of initial findings include:

- The current fail points for the APRT events reflect gender-based standards. If the cut-off for failing the APFT pushup and 2-mile run was not adjusted for gender, a much higher percentage of females compared with the percentage of males would fail. The sit ups do not present this gender difference. The gender impact is much lower for some new proposed events (e.g. rower, shuttle and $\frac{1}{2}$ -mile run (~800 yards)). This suggests that use of certain events as a fitness standards may be considered ‘unfair’ if they are not made gender specific. Other events, such as sit ups, rower, or short runs (shuttle, $\frac{1}{2}$ -mile) may be more “gender-neutral.”

- Review of literature, Focus Groups of Soldiers, and SME recommendations has helped to identify key common Army-required physical task capabilities most critical to military operations. Specific tasks of interest include:
 - Moving short distances quickly, with varying amounts of weight or load, and including over walls and obstacles. Load Weight is a key factor as to ability – focus group responses noted concerns with slower speeds especially while sprinting, marching, crawling, and climbing over obstacles when loads exceeded 35-40 pounds.
 - Lifting, lowering, carrying, dragging items (e.g., lifting, carrying, dragging sand bags and casualties). Digging (e.g. sand or dirt to fill and carry sandbags) pertains to the task “Prepare Fighting Position” which is still considered a reasonably anticipated task. To some extent lifting weights 25-40 pounds was noted at reasonable expectation by focus groups while heavier weights less likely to be ‘baseline Soldier’ requirements (or could be conducted by more than one Soldier).
- Despite study design limitations during the Fort Carson field study, self-reported perceptions of the events requiring highest physical demands as well as some correlation data provide some useful information regarding these task and associated events or activities:
 - Performance of tasks that require lifting, carry, and dragging (of items and casualties) are highly correlated to each other. Several individual events are also correlated to certain tasks that they are not a component. Therefore, a test of physical capability that is correlated to one task may be used to represent capability of one or more of the other tasks. Key task of greatest interest from activities in this report include the Sandbag Stack of the Prepare Fighting Position task and the Skedco Pull form the Perform Combatives task.
 - Self-reported ranking of perceived physical difficulty with tasks and events did support some correlation findings. The Skedco Pull, along with Casualty Drag, was ranked as the most physical demanding events of those evaluated.
 - For females, height and weight appear to be key differentiating factors to correlations with certain tasks and events. There were no noteworthy correlations to any tasks with APFT scores. For males, no noteworthy correlations were noted for any physical variables, or APFT scores with tasks and individual field events.
 - Though correlations only showed it with females, both shorter men as well as women reported notable difficulties with completing the Sand bag Stack once they were wearing Fighting Load. This was described as due to equipment designs (e.g., the ammo pack) which hindered movement.
- Consideration should be given to how specific tests may increase training injury risk (for example, increasing the 2-mile run to 3 miles, or including a long road march could increase risk of lower extremity injuries).
- Some physical fitness tests result in much higher percentages of males passing if scored against a single standard. This includes the current 2-mile run and push-ups. For other tests (e.g., sit ups or proposed tests such as rowing or sprints) there appears to be less gender bias.
- While fitness tests have been associated with different aspect of fitness (cardio respiratory endurance, muscular strength, muscular endurance), and while certain tasks have been

described as been associated with one or more of these fitness components, the association of the test to the Army's current key physical tasks has not been scientifically documented. Data that specifically evaluates this relationship will be published as a result of the ongoing systematic review.

The USAPHC AIPH Injury Prevention Program is currently continuing efforts to compete and publish supporting reports regarding the results of our systematics reviews.

11 Point of Contact

The Injury Prevention Program is the point of contact for this project, 410-436-4655, DSN 584-4655.

APPENDIX A

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APPENDIX B

History of U.S. Army Physical Fitness Testing

Though the current APFT was established in the 1980s, there were many different tests prior that time, and proposals and review for change since then prior the current 2011-2012 proposed tests. This Appendix documents slides from a presentation prepared by Dr. Whitfield (Chip) East, Department of Physical Education - United States Military Academy (West Point). The Table summarizes the tests identified in his slides.



APFT History

Army conducts numerous conferences to review, revise, update physical readiness training and assessment:

- 1958 – Physical Fitness Seminar, hosted by the United States Army Infantry School, FT Benning, GA, 21-24 April, 1958.
- 1970 – Physical Fitness Symposium, hosted by the USAIS, FT Benning, GA, 12-14 October 1970.
- 1980 – Department of Defense Study of the Military Services Physical Fitness; hosted by the Secretary of Defense, 17-19 June 1980.
- 1990 – National Conference on Military Physical Fitness, hosted by the President's Council on Physical Fitness and Sports, in cooperation with the National Defense University, 25-26 January 1990.
- 2010 – Army Physical Fitness Test Working Group, hosted by the USAPFS, Fort Jackson, SC, 26-27 October, 2010.

History of Army Physical Readiness Training & Assessment

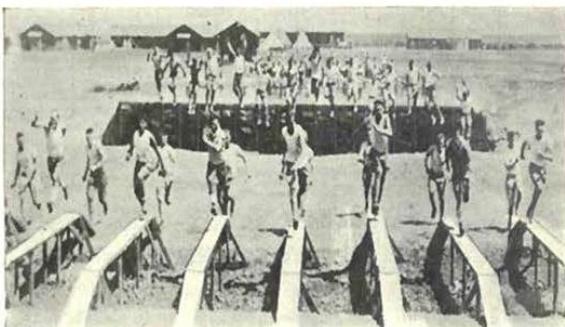


FIG. 120.

World War I – The Princeton Years

- Chairman/Professor of Hygiene and Physical Education
- Introduced mass athletics - sports into training camps
- Mass Physical Training (1919) – approved by Army War Dept

Joseph Raycroft

Individual Efficiency Test (IET)

- ✓ Based upon lessons learned from WWI
- ✓ Five-item combat readiness battery
 - 100-yd run
 - Running Broad Jump
 - 8' Wall Climb
 - Hand grenade Throw
 - Obstacle Course Run



Interwar Years (1920 – 1942)

Physical Training, Basic Field Manual - BFM (1936) – Volume I – Chapter 4.

Physical Training, Field Manual - FM 21-20, (1941): recommended a myriad of fitness tests designed to assess combat readiness.

Primary Assessments

- 100-yd Dash
- Running High Jump
- Running Broad Jump
- Pushups
- OCT – Obstacle Course Test

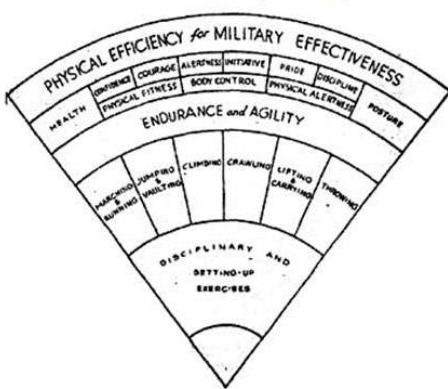
Individual Efficiency Test (IET)

- 100-yd run
- Running Broad Jump
- 8' Wall Climb
- Hand grenade Throw
- Obstacle Course Run

Secondary Assessments

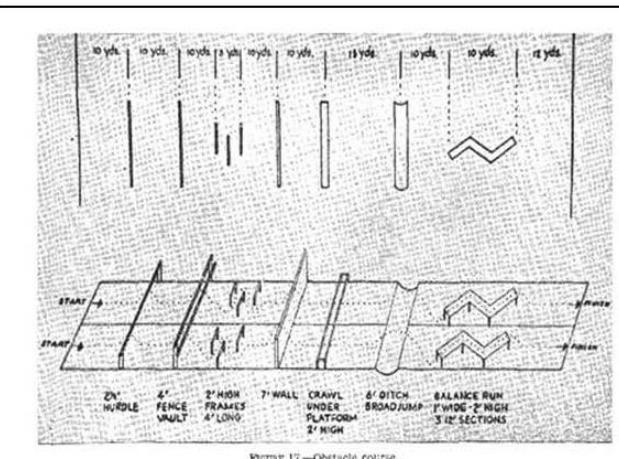
- Baseball Throw
- Basketball Throw
- Bar Vault
- $\frac{1}{4}$ mile run
- $\frac{1}{2}$ mile run
- 2 mile walk
- Vertical jump
- Pull-ups
- 20' rope climb
- Stand/Run hop-skip-jump
- Standing backward jump
- Running long dive

FM 21-20 (1941)



Kelton's Outcome Assessments

- scale a 15' wall without instruments
- vault a horse 15 hands high
- leap a ditch 10' wide
- run a mile in 8 min or two miles in 18 min
- walk 4.5 miles in one hour
- walk 3 miles/hour with 20 lb knapsack (arms and equipment)
- swim a mile and repeat
- dive and swim underwater for 45 sec
- dive head foremost from a height of 8 feet
- leap into the water from a height of 20 feet
- demonstrate proficiency in use of the foil, sword, and bayonet



World War II

- 7 December 1941 – Pearl Harbor
- 1942 – Army Ground Forces Training Directive
 - ✓ Army Ground Forces (AGF) Test
 - ✓ “highly encouraged”
 - ✓ Contained six (6) events:
 - Pushups
 - 300-yd Shuttle Run
 - 20-sec Burpee Test
 - 70-yd Pig-a-back Run (carrying Soldier of equal weight)
 - 70-yd Zig-zag Run(creep, crawl, jump, run)
 - 4-mile Road March



World War II

Physical Conditioning (DA Pamphlet 21-9, May 1944)

- ✓ Physical Efficiency Test Battery- PETB replaces AGFT
- ✓ First time use of normative scales (0-100)
- ✓ PETB was designed to measure the “man’s total score”
- ✓ Contained seven (7) test events:

▪ Pull-ups	AGFT
▪ 20-sec Burpee Test	▪ Pushups
▪ Squat Jumps	▪ 300-yd Shuttle Run
▪ Pushups	▪ 20-sec Burpee Test
▪ 100-yd Pig-a-back Run	▪ 70-yd Pig-a-back Run
▪ Sit-ups	▪ 70-yd Zig-zag Run
▪ 300-yd Shuttle Run	▪ 4-mile Road March



Post World War II to Korea

Physical Training (FM 21-20, 1946 & 1950)

- ✓ Introduced two physical fitness test batteries (PFTB) – “Outdoor” and “Indoor”
- ✓ Terminated AGF Test
- ✓ Revised PETB (eliminated burpee/pig-a-back)

PFTB Outdoor Battery

- Pull-ups
- Squat Jumps
- Push-ups
- Sit-ups
- 300-yd Shuttle Run

PFTB Indoor Battery

- Pull-ups
- Squat Jumps
- Push-ups
- Sit-ups
- Shuttle Run (250 yds) or 60-sec Burpee Test

Post Korean War

Task Force Smith - “As the reports came back from Korea, an alarming number of casualties were attributed to the inability of the U. S. soldiers to physically withstand the rigors of combat over rugged terrain and under unfavorable climatic conditions.” (FM 21-20, 1957, p. 10)

FM 21-20, Physical Training and TM 21-200, Physical Conditioning (1957)

- ✓ Retained the Physical Fitness Test Battery (PFTB) - outdoor
- ✓ Introduced the Physical Achievement Test (PAT); which was only administered to “combat type units” and was designed to measure combat readiness.

Physical Fitness Test Battery (PFTB)

- Pull-ups
- Squat Jumps
- Push-ups
- Sit-ups
- 300-yd Shuttle Run

Physical Achievement Test (PAT)

- 5-sec Rope Climb
- 75-yd Dash
- Triple Broad Jump
- 150-yd Man Carry
- 1-mile Run

Pre Vietnam War

Change 1: TM 21-200, Physical Conditioning (1961) introduced the Physical Combat Proficiency Test (PCPT).

- ✓ The PETB and PAT fitness tests were terminated
- ✓ PCPT was designed to assess individual and unit fitness
- ✓ Minimum performance times/scores were provided

Physical Combat Proficiency Test

- 40-yd Low Crawl
- Horizontal Ladder Test (1-min)
- Dodge, Run, and Jump
- Grenade Throw
- 1-mile Run

PFTB

- Pull-ups
- Squat Jumps
- Push-ups
- Sit-ups
- 300-yd Shuttle Run



Vietnam War

Physical Readiness Training (FM21-20, 1969)

Retained the 5-item Physical Combat Proficiency Test (PCPT) and identified three additional specialty tests.

- ✓ PCPT: 40-yd low crawl, horizontal ladder, dodge/run/jump, grenade throw, 1-mile run
- ✓ Army Minimum PFT – Male: squat bender, sit-ups, push-ups, leg over, burpee, stationary run
- ✓ Airborne Trainee PF Qualification Test: chin-ups, bent-leg sit-ups, push-ups, half knee bend, 1-mile run
- ✓ Inclement Weather PFT: push-ups, knee bender, sit-ups, side step (jumping jacks), squat thrust (burpee)

Post Vietnam War

Physical Readiness Training (FM 21-20, 1973)

Introduced the Advanced Physical Fitness Test (APFT), the Staff-Specialist PFT (SSPFT), and the Basic PFT (BPFT).

- ✓ APFT: inverted crawl, bent leg sit-ups, run/dodge/jump, 2-mile run
- ✓ SSPFT: push-ups, bent leg sit-ups, run/dodge/jump, 1-mile run
- ✓ BPFT (for trainees < 40): inverted crawl, bent leg sit-ups, run/dodge/jump, 1-mile run
- ✓ FM 21-20 (1973) also recognized four (4) specialty tests:
 - Inclement Weather PFT
 - Minimum PFT – Male
 - Airborne Trainee PF Qualification Test
 - Ranger/Special Forces PF Qualification Test

Women's Army Corps

FM 35-20, Physical Fitness for Women (1975) approved four physical fitness tests for women.

- ✓ Advanced PFT: 80m shuttle run, modified pushups (knees), run/dodge/jump, modified sit-ups (crunches), 1-mile run
- ✓ Basic PFT (for basic trainees): 80m shuttle run, modified pushups (knees), run/dodge/jump, modified sit-ups (crunches), .5-mile run
- ✓ Staff-Specialist PFT: 80m shuttle run, modified pushups (knees), run/dodge/jump, modified sit-ups (crunches), stationary run
- ✓ Airborne Trainee PF Qualification Test: incline chin-up (approximately 45° angle), modified pushups, modified sit-ups, knee bender, 1-mile run

Unclassified

Cold War PRT

Physical Readiness Training (FM 21-20, 1980)

Introduced the Army Physical Readiness Test (APRT):

- ✓ Supersedes FM 21-20 (1973) and FM 35-20 (1975) establishing the first gender integrated Physical Readiness Training manual
- ✓ Men and women performed same 3-event PRT
- ✓ Stipulations for the APFT were: easy to administer (administer anywhere) and minimal need for equipment
- ✓ Soldiers > 40 years/age were not allowed to test PU or SU:
 - Soldiers (ages 17-39): Push-up, Sit-up and 2-mile Run
 - Soldiers (ages 40-60): 2-mile run or alternate cardio event
- ✓ 1982 – U.S. Army Soldier Physical Fitness Center – FT Ben Harrison
- ✓ 1983 – Master Fitness Trainer Course (6P – ASI)

Breaking the 40 year old Barrier

Physical Fitness Training (Change 1, FM 21-20, 1986)

- ✓ 23 June 1986 Headquarter DA published Change 1.
- ✓ Scoring standards were change to 5-year age increments
- ✓ With 5-year age increments 17-21... a 37-41 age group was established, effectively breaking the 40 year old age barrier
- ✓ Minimum performance scores (60-pt score) for 17-21 year old men and women changed significantly
- ✓ 60-pt scoring standards (17-21):
 - Men PU = 42, SU = 52, 2MR = 15:54
 - Women PU = 18, SU = 50, 2MR = 18:54

Unclassified

Proposed APRT (2002)

The PROPOSED six event APRT consists of the following events:

✓ Long Jump	(2 x 5 second jumps)
✓ Power Squat	(1 minute)
✓ Heel Hook	(1 minute)
✓ Shuttle Run	(6 x 25 yard sprints)
✓ Push-Ups	(1 minute)
✓ 1 Mile Run	(As fast as you can)

Note: There are no exceptions to this sequence.

APPENDIX C

**USAPHC Talking Point Paper and White Paper
Changes to the Army Physical Fitness Test,
29 February 2012**

An initial review of various potential events and effects on physical performance and injuries.

TALKING POINT PAPER

MCHB-IP-DI
29 February 2012

SUBJECT: Changes to the Army Physical Fitness Test

1. Purpose: To provide talking points on the potential effects of proposed changes to the Army Physical Fitness Test on physical performance and injuries.

2. Talking Points:

- The current APFT effectively measures three key components of physical fitness necessary for warrior tasks: aerobic endurance, muscle endurance, and body composition.
- Two-mile run time, the APFT measure of aerobic endurance, is predictive of individual and unit readiness as well as performance on operational tasks.
- Advantages of the current APFT include its ease of administration and the ability to assess Soldier fitness over multiple decades.
- Current physical training doctrine, Army PRT, is built on established scientific principles that improve physical fitness while minimizing overtraining and injuries.
- Training for a 4-mile APFT run event will increase cumulative running mileage, which will increase injuries.
- Training for a 12-mile road march APFT event will result in greater training time requirements and increased injuries.
- Prior studies of physical performance tests should be considered in development of a new APFT.
- Any new tests selected for the APFT should measure recognized components of health and operational fitness, be safe and easy to administer, allow for comparisons to past fitness measures, and should encourage Soldiers to train for the test such that health-related fitness is enhanced and risk of injury is minimized.
- A tiered approach to physical fitness testing that allows for assessment of a base level of fitness and additional assessments according to occupational specialty and common military tasks identified by NATO [24] should be considered.

Drs. Jones and Chervak/MCHB-IP-D1/410-436-1377

APPROVED BY: LTC(P) Cersovsky

WHITE PAPER

MCHB-IP-DI
29 February 2012

SUBJECT: Changes to the Army Physical Fitness Test

1. Purpose: To summarize the potential effects of proposed changes to the Army Physical Fitness Test on physical performance and injuries.
2. Background.
 - a. GEN Odierno (CSA) will make a decision shortly on proposed changes to the Army Physical Fitness Test (APFT), including possible new events, to be implemented on 1 October 2012. Events that have been considered for the new APFT include the 60-yard shuttle run, one-minute rower, standing long jump, one-minute push-ups, and a 1.5-mile run. In February 2012, the Sergeant Major of the Army suggested that a 4-mile run and 12-mile ruck march with load should be part of the new APFT, rather than a 1.5-mile run. He also suggested replacing push-ups with dead-hang pull-ups and changing the rower event time from one to two minutes.[1]
 - b. At least 5 changes to the Army's physical performance test have been documented since 1941, when the first Army physical performance test was published.[2] Prior tests have included events considered in the proposed test such as pull-ups and shuttle run. The current 3-event test was established in 1980, and has not been altered except to twice revise the point standards.[2]
3. Physical Fitness, the APFT, and Injury Risk
 - a. Components of performance-related physical fitness are aerobic endurance, muscle endurance, muscle strength, muscle power, speed, flexibility, agility, balance, reaction time, and body composition.[3] The current APFT measures 3 of these components: aerobic endurance (run event), muscle endurance (push-up and sit-up events), and body composition (body mass index). Aerobic endurance is necessary for warrior tasks such as running or marching under load from one point to another, engaging in man-to-man combat, and evacuating a casualty.[4] Muscle strength and endurance are necessary for nearly all essential warrior tasks such as moving under fire, running or marching with a load, engaging in man-to-man combat, employing hand grenades, and evacuating a casualty.[4]
 - b. The current APFT measure for aerobic endurance, 2-mile run time, is a validated performance metric. Two-mile run time is highly correlated with maximal oxygen uptake ($VO_{2\text{max}}$), the gold standard for aerobic fitness,[5] and has been associated with performance on simulated battlefield tasks such as obstacle course completion, a 400-meter run, and a 30-meter rush.[6] In addition, research and field investigations conducted from the early 1980s to the present have demonstrated that low aerobic endurance is consistently associated with injury, a key determinant of individual and unit readiness. Soldiers with the lowest aerobic fitness (slowest run times) experience a 1.4

to 2.8 times greater risk of injury compared to the most aerobically fit.[7-12] While other measures of fitness (e.g., push-ups, sit-ups, and muscle strength) have been shown to be associated with injury risk, the strength of the associations have not been as consistent or strong. Monitoring APFT run time performance can provide commanders with insights into the overall fitness and potential for injury among their Soldiers. Decreased or stagnant fitness levels plus increased injury rates are markers for overtraining.

c. The current APFT measure for body composition, the body mass index (BMI), when gender- and age-adjusted, is considered a reasonable indicator of body fat for population-based assessments.[13] When BMI and fitness levels are examined, Soldiers with high BMIs and high aerobic fitness (e.g., performance on the APFT run event) have lower injury risk. Specifically, during Army basic combat training, aerobically fit male Soldiers with a high BMI (>27.3) had an injury risk of 21% compared to an injury risk of 28% for unfit males with a low BMI (<22.2). Aerobically fit female Soldiers with a high BMI (>25.5) had an injury risk of 38% compared to an injury risk of 61% for unfit females with a low BMI (<21.3).[14]

d. Advantages of the current APFT also include its ease of administration and, given the accumulation of over 20 years of standardized test results, the ability to assess and compare Soldier fitness over time. Given the sit-up, push-up, and run events test different muscle groups and/or fitness components, the events can be conducted on the same day. This could not be accomplished if the APFT included two weight-bearing aerobic events (i.e., a run and a road march). In addition, the current APFT has minimal equipment requirements and can be administered with relatively few staff. Administration of alternative fitness tests such as a shuttle run, standing long jump, or pull-up would require additional staff and equipment such as permanently installed pull-up bars of a standardized circumference, standardized surface for the shuttle run, tape measures, and cones. If testing was conducted outside, the condition of the pull-up bars and ground surface would have to be considered, as the ability to maintain grip or footing while making abrupt changes in direction would be affected by cold and/or wet conditions, which could increase the risk of injury.[2]

e. The current doctrine for physical training, the Army Physical Readiness Training (PRT) Program, was implemented in 2004. It is built on the established principles that injuries can be avoided and desired physical fitness can be obtained by gradually introducing weight-bearing training, limiting total running volume, and including training to enhance agility, mobility, and coordination.[4, 15] Prior studies of both Marine and Army units demonstrated that running distances during training could be reduced without decreasing desired aerobic performance gains.[16, 17] In an evaluation of Army PRT, units conducting traditional Army physical training had a 40% greater injury incidence compared to units conducting Army PRT, yet there were no differences in fitness gains (APFT pass rates) between the units.[18] Surveillance of basic combat training injuries showed a 29% reduction in injury rates during the first 4 years of implementation.[19]

4. Potential Effects of 4-mile Run and a 12-mile Road March APFT Events

a. By increasing the APFT run event to 4 miles, reductions in basic combat training injury rates would likely reverse, as units train for the APFT by running even greater distances. Numerous civilian and military studies have demonstrated that higher cumulative running mileage increases the risk of lower extremity injury. While increasing running mileage can result in enhanced aerobic fitness, there are thresholds at which injury risks increase but fitness levels remain the same or decrease. For example, among runners training 3 days/week at 85-90% maximum heart rate, the group that trained for 45 minutes/day experienced a 54% injury incidence and a 16.9% increase in endurance (as measured by maximal oxygen uptake, or $VO_{2\text{max}}$).[20] In comparison, the group that trained for 30 minutes/day experienced a much lower injury incidence (24%) with similar gains in endurance (16.1%). In a study of running mileage during Army infantry initial entry training, a unit that ran 130 miles experienced a 29% higher injury incidence with no difference in two-mile run time compared to a unit that ran only 56 miles.[17] Evidence such as this prompted the Joint Services Military Injury Prevention Working Group to rank 'prevention of overtraining' as the top priority for prevention of physical training-related injuries.[21] Such effects have also been seen recently in a 2010 analysis of infantry physical training. In this analysis, Soldiers in units who ran more than 16 miles per week had a 75% greater risk of injury compared to units who ran less than 7 miles per week, with no difference in APFT performance.[22]

b. Similarly, if personnel are being tested on a 12-mile road march with a load, units will train for this event by conducting more and longer road marches. Increased injuries as a result of road marching can be expected.[23-25] As an example, 24% of Soldiers in a light infantry unit were injured during a 20 km (12.4 mile) road march carrying a 46 kg (101 pound) load.[26] The majority (77%) were lower extremity injuries such as blisters, metatarsalgia, and sprains/strains, with back pain/strain making up the remaining 23%. Injuries reported in other studies of military road marches have also included stress fractures, knee pain, and rucksack palsy.[25] Methods to reduce march-related injury risk have been described [25], and regular aerobic and resistance training, as well as routine road marching with load have been recommended to improve road march capabilities.[24, 27] However, adding this training event as well as a 4-mile run would greatly increase training time and injuries resulting from the extensive weight-bearing training Soldiers will be required to perform. Pilot testing and development of appropriate standards would also be required for this test. Such a road march test would be better suited for an operational test battery.

5. Considerations for the Development of a New APFT

a. Prior studies have investigated alternative laboratory and field expedient physical performance tests and the reported relationships to operational tasks in military populations.[6, 28-30] Findings of these studies should be thoroughly reviewed by appropriate organizations and subject matter experts when considering development of new events for the APFT.

b. Regardless of the specific test events selected for the new APFT, the test should measure recognized components of health and operational fitness, be safe and easy to

administer, allow for comparisons to past fitness measures, and should encourage Soldiers to train for the test such that a base level of physical fitness is attained and maintained. As stated in a 1999 consensus statement from the Research Workshop on Physical Fitness Standards and Measurements within the Military Services, required maintenance of a base level of physical fitness "promotes a standard of physical readiness commensurate with the active life style and deployability of the military profession" and serves a "common goal of motivating service members toward good fitness habits, physical training participation, and a healthy life style." [31] However, a number of occupational specialties arguably have additional physical demands for which a "second tier" of operational fitness test measures could be developed to evaluate and test additional job-specific fitness requirements. [31]

6. Conclusions.

- a. The current APFT effectively measures three key components of physical fitness necessary for warrior tasks: aerobic endurance, muscle endurance, and body composition.
- b. Two-mile run time, the APFT measure of aerobic endurance, is predictive of individual and unit readiness as well as performance on operational tasks.
- c. Advantages of the current APFT include its ease of administration and the ability to assess Soldier fitness over multiple decades.
- d. Current physical training doctrine, Army PRT, is built on established scientific principles that improve physical fitness while minimizing overtraining and injuries.
- e. Training for a 4-mile APFT run event will increase cumulative running mileage, which will increase injuries.
- f. Training for a 12-mile road march APFT event will result in greater training time requirements and increased injuries.
- g. Prior studies of physical performance tests should be considered in development of a new APFT.
- h. Any new tests selected for the APFT should measure recognized components of health and operational fitness, be safe and easy to administer, allow for comparisons to past fitness measures, and should encourage Soldiers to train for the test such that health-related fitness is enhanced and risk of injury is minimized.
- i. A tiered approach to physical fitness testing that allows for assessment of a base level of fitness and additional assessments according to occupational specialty and common military tasks identified by NATO [24] should be considered.

Drs. Jones and Chervak/MCHB-IP-DI/410-436-1377

APPROVED BY: LTC(P) Cersovsky

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APPENDIX D

USAPHC-IPP EXSUM - AUG 2012 (Initial TRADOC Tasker VTC)

UNCLASSIFIED
EXECUTIVE SUMMARY
30 Aug 2012

(U) SUMMARY OF VTC REGARDING REVISED APFT TASKER. (U) (MCHB-IP-DI) Drs Jones and Nindl, CPT DeGroot and Mr Hauret and Mr Grier participated in a VTC organized by LTC David DiNenna, HQDA DCS G-3/5/7 in order to clarify issues regarding the revised APFT and other taskers. Also in attendance from HQDA were SGM Wells and SGM Hank McClellan, who lead the discussion. Mr Mike Haith and SGM Taylor from TRADOC and personnel from USARIEM also participated. SGM McClellan stressed that there are multiple taskers regarding fitness testing and physical training and that communication and transparency, especially with HQDA, is important in light of the issues with the now-defunct earlier attempt to revise the APFT. Mr Haith expressed his intention to keep TRADOC senior leaders apprised as the process to develop a new APFT proceeds, as reflected by the Decision Brief dates in the draft EXORD. The meeting was beneficial for AIPH personnel for situational awareness purposes.

CPT DeGroot/MCHB-IP-DI/
APPROVED BY: Dr Bruce Jones

UNCLASSIFIED

APPENDIX E

Reviews by Subject Matter Experts of the 2012 Proposed Army Physical Readiness Test (APRT)

March - April 2012

DESCRIPTION:

Table E-1. Army Physical Readiness Test (APRT) as a proposed APFT replacement included the following 5 tests:

1. Test	2. Measure
3. 60-yard Shuttle Run	4. (agility)
5. 1 min Rower	6. (muscular endurance)
7. Standing Long Jump	8. (leg power)
9. 1 min Push-up	10. (upper body muscular endurance)
11. 2-mile Run	12. (cardio-respiratory endurance)

Army Combat Readiness Test (ACRT) was conceptualized to be a separate gender/age free test for readiness (e.g. prior deployment):

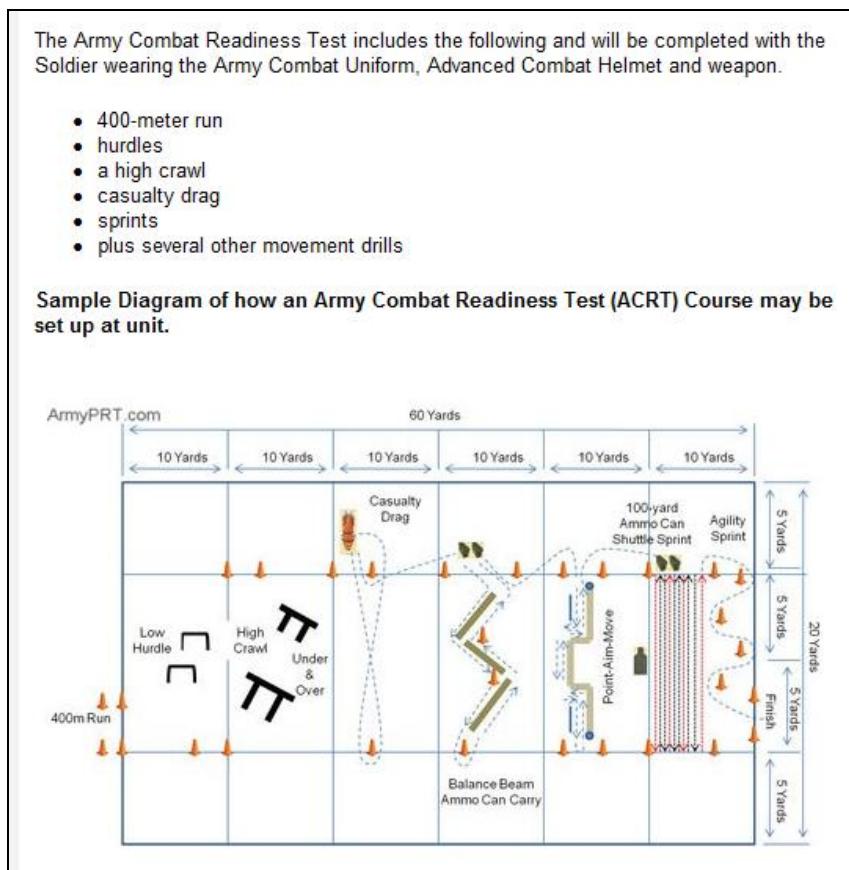


Figure E-1. Concept for ACRT

REVIEW:

In order to advise Army headquarter decision-makers as to whether to implement the new APRT, three groups of subject matter experts (SMEs) were requested by TRADOC to evaluate the APRT by answering the following questions. The responses are provided in the following pages of this Appendix:

1. Is the proposed five-event APRT the right test?
2. Are the five events the right events?
3. Do these five events test what we (the Army) want to test?
4. Is the APRT fair (does height, weight, age affect performance)?
5. What scoring system would best ensure fairness?

Dr. Todd Crowder and Dr. Whitfield East
Department of Physical Education - United States Military Academy (West Point)

Purpose: The purpose of this validation is to provide the CG TRADOC with a level of confidence that confirms that the proposed five-event Army Physical Readiness Test (APRT) is an appropriate replacement for the current Army Physical Fitness Test (APFT).

Question #1: *Is the proposed five-event APRT the right test?*

To determine if the proposed five-event APRT is the “right test”, we must first establish a cross-validation criterion. We first reviewed the myriad of tests that have been used by the Army to assess physical readiness. We also reviewed the limited number of studies that have addressed the physiological demands of combat. Further, we considered that current theater engagements should not dictate the demands of future full spectrum combat operations in varying terrains, climates, and diverse theaters of operations.

The logical criterion for a physical readiness assessment is the physiological needs of the modern combat Soldier, with a concomitant criterion-referenced measure. Unfortunately there is little or no conclusive research on the physiological demands of combat (i.e., with current uniform, IBA and gear). Therefore, utilizing only a historical perspective with limited physiological combat assessment data, it is problematic to determine if this five-event APRT is the “right test”. Without some criterion-referenced basis on which to judge the construct validity of the 5-event battery, our response can only be based upon the intuitive face validity of the five events. In order to improve the basis of our analysis, we will utilize the following three referent criteria to analyze the five events: (1) the attributes of a “good” fitness test items, (2) TRADOC’s initial event stipulations, and (3) our philosophy of physical readiness training.

(1) There are five primary attributes of a “good” test event:

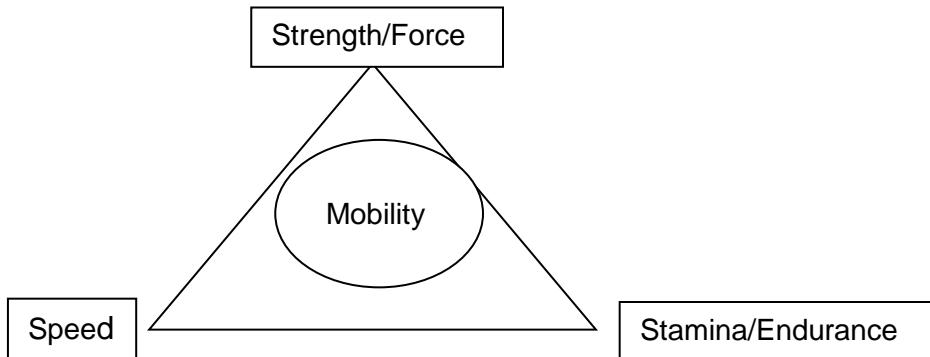
- Validity – events should measure what they purport/intend to measure. Since we have no criterion-referenced standard upon which to conduct a construct validation, the best we can offer is opinions relative to the face validity of each test event.
- Reliability – scores must be replicable over “time”.
- Objectivity – scores must be replicable over “raters”.
- Discrimination – scores discriminate between levels of performance.
- Authenticity – events should have some functional connection to combat readiness.

(2) As we understand it, these are the current stipulations for the APRT:

- Minimal need for “equipment”.
- Event battery should be administrable in 60-120 minutes.
- The rater/Soldier ratio should be relatively low.

- Events should be administrable in a relatively confined area with close proximity between events.

(3) Our underlying physical readiness training (PRT) model is similar to TC 3-22.20. The nexus of our model is “mobility”, which represents the confluence of strength, speed, and stamina:



- Strength/Force: ability to overcome resistance; strength is a high intensity action.
- Stamina/Endurance: ability to do sustainable physical work; stamina is low intensity action.
- Speed: ability to move rapidly over a given distance; speed is a high intensity action.

Question #2: Are the five events in the proposed PRT (60-yd shuttle run, 1-min rower, standing long jump, 1-min push-up w/no rest and 2-mile run); are these the right events?

Attribute analysis of the five PRT events:

Event	Assessment	Face Validity	Reliability	Objectivity	Discrimination	Authentic
Shuttle run	Agility	good	good	good	moderate	fair
Push-ups	upper-body endurance	good	moderate	poor	good	fair
Rower	core-body endurance	good	moderate	fair	good	moderate
Long jump	lower body power	good	moderate	moderate	moderate	fair
2-mile Run	C-R endurance	good	good	good	good	moderate

Analysis of the 5-event battery aligned with current APRT stipulations:

Strength/Force: There are many events that can be used to assess muscular strength. Most strength assessments focus on the upper body (shoulder) and lower body (hips/low back). Based upon Stipulations 1 & 4, there are no true strength measures (1RM bench press, 1RM back squat, 1RM dead lift) that would be acceptable to the Army. We, therefore, recommend including two functional strength/power/endurance assessments; as a measure of functional strength/ endurance in the upper body we recommend the Chin-Up and as a measure of functional strength/power in the upper and lower body we recommend the “100-yd Load Carry”.

Chin-ups: Have been used on numerous occasions in Army PR tests.. We recommend some administrative device (like a cadence) to ensure Soldiers come to full extension. We further recommend an “incline chin-up” option for women to score at the 60-65 point level and the awarding of 70 pts for 1 chin-up. Chin-ups score well on virtually every test attribute:

- Chin-ups and chin-up bars are ubiquitous throughout the Army.
- Rater/Soldier ratio is high, but no greater than the current push-up event and is mitigated by the minimal administration time, < 1 minute per Soldier.
- Chin-ups have a relatively high degree of reliability, objectivity, and authenticity.
- Promotes the strengthening of the upper arm/shoulder and posterior-chain muscles to improve shoulder stability and prevent shoulder injuries.

The only issue is the chin-up test is body mass centric; i.e., big, heavy soldiers (fat or muscle) score lower than small, light soldiers. An ancillary benefit to this issue is the chin-up test will serve as a forcing function for lowering body fat.

100-yd Load Carry: Soldiers would “carry” (lift/drag) an 80-pound load 100 yards for time. Soldier may lift this load in any fashion or drag it 100 yards.

- 100-yd Load Carry simulates an event that has been used in three different Army PRTs; the Army Ground Forces Test (1942) – 70-yd “pick-a-back” run, the Physical Efficiency Test Battery (1944) – 100-yd “pick-a-back” run, and the Physical Achievement Test (1957) - 150-yard man carry.
- Rater/Soldier ratio is low.
- Minimal need for equipment (canvas bag, sand, cones, stopwatch).
- Administration time would average < 1 minute per Soldier.
- 100-yd Load Carry has a relatively high degree of reliability, objectivity, authenticity (WTBDs – casualty evac), and discriminates well.
- 100-yd Load Carry provides some equity versus body mass by assessing functional strength/force/power in the lower/upper body.

Stamina/Endurance: The two primary stamina/endurance domains are cardio-respiratory and muscular:

- Cardio-respiratory stamina is the ability to accomplish sustainable, low intensity work. Some of the more common field measures are:
 - Runs for distance (1, 1.5, 2, 3, 4 miles) or time (9-min, 12-min, etc.)
 - Road march for distance (3, 6, 9, 12, 15 miles) – generally with load
 - Stationary or road bike (5, 10, 15 miles)

2-mile Run (2MR): We recommend retaining the 2-mile run in the APRT as a measure of cardio-respiratory endurance.

- 2MR has been used in the Army since 1975.
- Rater/Soldier ratio is low.

- Minimal need for equipment (flat running surface).
- Administration time would average < 20 minutes per Soldier.
- 2MR has a relatively high degree of reliability, objectivity, and discriminates well.
- Muscular endurance – Field measures of muscular endurance generally focus on the shoulder/upper body, hips/lower body and core body. Most field-expedient events have moderate to poor objectivity (due to the subjective performance criteria – i.e., the push-up), making the scores less reliable and therefore less valid. Some of the field measure are:
 - Upper body – pushups, pull-ups, dips
 - Core body – sit-ups, crunches, rower, ankles to the bar, heel hook, plank
 - Lower body - squats/knee bends, squat jumps, burpees/squat thrusts

Push-up: We do not recommend the inclusion of the push-up due to its poor objectivity and isolation/emphasis on anterior-chain muscles, which tends to destabilize the shoulder.

Rower: We recommend retaining the “rower” as a measure of core-body endurance; however we recommend adjusting the administration time to two minutes with no rest to mitigate objectivity issues and potential for soft tissue injuries (TC 3-22.20 uses the “rower” as a warm-up activity and recommends execution at a “slow cadence”).

- Rower-like tests have used in the Army since 1946.
- Rater/Soldier ratio is low.
- Minimal need for equipment (flat surface).
- Administration time would average < 2 minutes per Soldier.
- Rower has a relatively high degree of reliability, objectivity, authenticity (more functional than sit-ups, crunches, or plank) and discriminates well.

Mobility: Mobility is generally defined by the six components of skill-related fitness as influenced by a Soldier's strength, speed, and stamina:

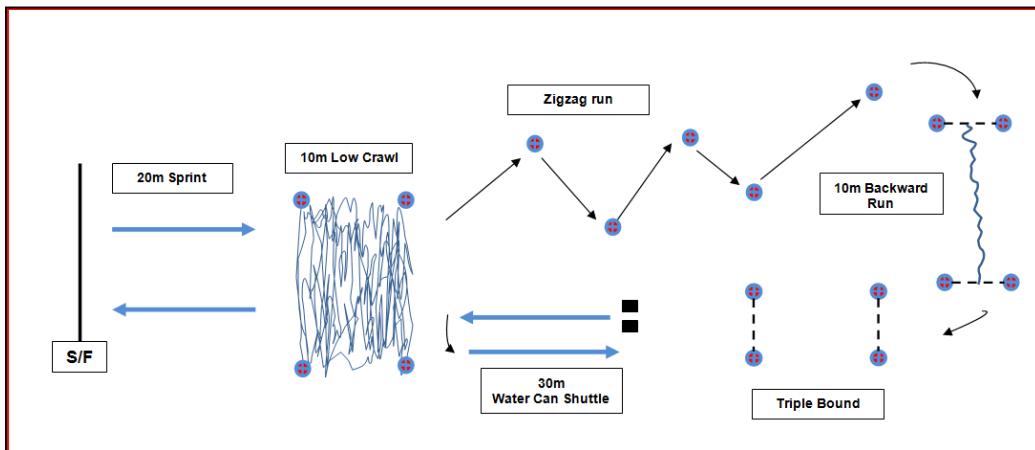
- Agility – shuttle run, 5-10-5 Pro agility test
- Speed – 40, 60, 100 meter sprint
- Balance – stork stand, balance beam walk
- Power – vertical jump, standing long jump, box jumps, Margaria-Kalamen Power test
- Flexibility – sit and reach
- Kinesthesia – spatial awareness of the body during movement

We can either choose to measure the various sub-components of mobility or develop a more authentic, functional test of general mobility. The current APRT proposes two sub-component tests: shuttle run - agility/speed, and standing long jump – explosive power.

Shuttle Run/Long Jump: We believe authenticity is crucial to the APRT. Therefore, we do not recommend including the shuttle run or the long jump based upon their lack of

authenticity, low ability to discriminate, and potential administrative time constraints for the long jump.

Mobility (MOB): We recommend the development of a functional measure of mobility that provides a higher degree of discrimination and authenticity. For over 25 years the Army used a mobility run to assess combat readiness: Army Ground Forces Test (1942) – 70-yd zig-zag run and Physical Combat Proficiency Test (1961) – dodge, run, and jump. Listed below is an example of a functional mobility test (MOB). This test incorporates all of the sub-components of mobility into a functional 1-shot test. The MOB has significantly greater authenticity than the shuttle run and still meets all Army event stipulations; equipment needs and set-up time are minimal and you can test a large number of Soldiers quickly (the test would last < 90 seconds). The MOB also discriminates well among Soldiers.



Summary for Question #2:

We recommend an alternative 5-event battery to test physical readiness that will measure cardio-respiratory stamina, upper-body functional strength, lower-body functional strength, core-body endurance, and mobility. The entire APRT should be completed in ACUs with running shoes. The five test events (in order) are:

1. **MOB** – as a functional measure of mobility (fundamental and motor skills), Soldiers will execute the 90-sec mobility run course
2. **Rower** – as a functional measure of core body endurance, Soldiers will execute the “rower” as described in TC 3-22.20 for a maximum of 2 minutes not to exceed 100 repetitions (100 points). There is no rest position.
3. **100-yd Load Carry** – as a functional test of leg/lower back strength/force, Soldiers will “carry” an 80-pound load 100 yards for time. The load may be lifted to the shoulders as in the “Fireman’s carry”, carried in front as in the “basket carry”, or “dragged”.
4. **Chin-ups** – as a functional measure of upper body strength/force. Soldiers will execute the chin-ups until the Soldier reaches momentary muscular failure. There is no rest position. The Soldier may use any of three grips: palms facing out, palms

facing in, or an alternate grip. The Soldier must generally maintain a generally straight body position throughout each repetition. The Soldier may not begin the next repetition until he/she has come to a fully-extended hanging position (or is prompted by the grader – “up” or a cadence).

5. **2-mile Run** – as a functional measure of stamina. Soldiers will run at their best sustainable speed for two miles.

Question #3: *Do these five events test what we (the Army) want to test?*

No - we recommend the five events listed above. To enhance, we further recommend consideration of adding an IBA to each event listed in Question #2 except the chin-ups (APRT-2).

Question #4: *Do these five events test what we (the Army) want to test?*

No, and to a relatively significant degree, neither does the revised 5-event APRT battery we recommended above (although we feel it is more authentic than the currently propose 5-event APRT battery). Without stipulations, we recommend the Army consider the five-event battery listed below. We believe if the Army established the physiological needs of the modern combat Soldier, these events could be tested and would emerge as measures of functional combat readiness.

1. **MOB** – as a functional measure of mobility (fundamental and motor skills), Soldiers will execute the 90-sec mobility run course
2. **Bench Press** (men = 175 lbs, women = 90 lbs.) – as a measure of upper body strength/force. Soldiers will execute repetitions at the specified weight to momentary muscle failure.
3. **100-yd Load Carry** – as a functional test of leg/lower back strength/force, Soldiers will “carry” an 80-pound load 100 yards for time. The load may be lifted to the shoulders as in the “Fireman’s carry”, carried in front as in the “basket carry”, or “dragged”.
4. **Chin and Curl** – as a functional measure of upper/core body strength/force, Soldiers will execute alternating repetitions of the “chin-up” and the ankles-to-the-bar (or heel hook) until the Soldier reaches momentary muscular failure. There is no rest position, palms may face out, in or an alternating grip may be used. Soldiers must generally maintain a straight body position throughout the entire repetition. The Soldier may not begin the next repetition until prompted by the grader – “up”.
5. **3-mile Run** – as a functional measure of endurance/stamina, Soldiers will run at their best sustainable speed for three miles.

Lastly, we recommend all test events (in Question #4) with the exception of the Bench Press be taken in ACU's with running shoes; in addition we recommend the “MOB” be taken in body armor. The bench press test will be taken on a separate day from the “field” events. The

MOB, 100-yd Load Carry, Chin and Curl, and 3-mile Run will be taken sequentially during a 60-minute testing period.

Question #5: Is the APRT fair?

Combat requires a variety of physical skills and abilities and there is no way to predict the full extent to the level of any engagement; i.e., who/what/when/where a Soldier will come into contact with the enemy and/or the physical extent of that contact. Therefore PRT assessments should be sufficiently rigorous to ensure mission success and personal safety/survivability. Combat is pass/fail and the only way to ensure that Soldiers are prepared for combat is to establish combat-focused criterion-referenced standards. Clearly we must account for physiological differences by age and gender; however this accountability should come during the “evaluation” phase, not during the assessment phase. Combat is not fair and when we interject “fairness” into the development of physical readiness assessments we jeopardize the overall mission.

Respectfully submitted; 10 April 2012:

Dr. Whitfield B. East, Professor

Dr. Todd A. Crowder, Associate Professor

Department of Physical Education

United States Military Academy

EXSUM Recommendations:	Current APRT with stipulations	Revised APRT with stipulations	Revised APFT no stipulations
Strength/Power (lower body)	Standing Long Jump	100-yd Load Carry	100-yd Load Carry
Strength (upper body)			Bench Press
Endurance/Strength	Push-up	Chin-up	Chin-Curl
Core Endurance	Rower	Rower	
CR Stamina	2-mile Run	2-mile Run	3-mile Run
Mobility	Shuttle Run	MOB	MOB

**Marilyn A. Sharp, M.S., Barry A. Spiering, Ph.D., Bradley J. Warr, MAJ, SP, Ph.D., MPAS
United States Army Research Institute of Environmental Medicine (USARIEM)**

Purpose:

The Director of the Army Physical Readiness Division (PRD) requested input from USARIEM personnel regarding the proposed Army Physical Readiness Test (APRT) as a replacement for the current Army Physical Fitness Test (APFT).

Responses to Specific Questions:

Is the proposed five-event APRT the right test?

[We interpret this as: “Is it better to perform the proposed five-event APRT or the alternatively proposed three-event APRT?”]

Response: Soldiering performance requires multiple physical capabilities, including aerobic endurance, muscle strength, muscle endurance, speed, power, agility, etc. The current APFT is limited to only assessments of aerobic endurance and muscle endurance. An advantage of the five-event APRT is that it captures a more diverse array of physical capabilities (aerobic endurance, muscular endurance, agility, and power), possibly making the five-event APRT a better assessment of soldiering performance. The burden of including two additional tests should be acknowledged, but the burden appears minimal and reasonable.

Are the five events (60-yd shuttle run, 1-min rower, standing long jump, 1-min push-up w/no rest and 2-mile run) the right events?

Response: Retaining the 2-mile run permits a historical assessment of changes in aerobic fitness over time. This is beneficial because Army investigators have large amounts of historical data indicating the utility of the 2-mile run for predicting performance on common soldiering tasks (Myers et al. 1984; Knapik et al. 1990; Harman et al. 2008) as well as predicting future injury risk (Knapik et al. 2001). With regards to the remaining four events, the answer is unknown because the criterion validity has not been established (i.e., no data have been collected to establish the relationship between these APRT tests and performance on common soldiering tasks). These four tests are based on face validity. In other words, in theory these tests seem to be a better indicator of performance on common soldiering tasks, but this theory has not been tested/validated/quantified. Furthermore, there are other field-expedient tests (e.g., pull-ups) that could possibly be better predictors of performance on common soldiering tasks; however, the criterion validity of other field-expedient tests has not been thoroughly investigated. Therefore, at this point it is not possible to determine if these four APRT tests are the “right events”, or if other field-expedient tests might be “better tests”.

Do these five events test what we (the Army) want to test?

Response: DODI 1308.01 mandates the assessment of aerobic endurance, muscle endurance, and muscle strength. DODI 1308.01 correctly defines strength as the maximal ability of the neuromuscular system to produce force in a single repetition. There is no debate that the current APFT assesses aerobic endurance and muscle endurance. There is also little

debate that the APFT does not adequately assess muscle strength. Therefore, muscle strength is the critical variable not current assessed by the APFT.

The Army PRD has been handcuffed by a requirement mandating that physical performance tests should utilize no equipment. This requirement has forced the Army PRD to rely on field-expedient tests such as the broad jump to assess muscle strength. The broad jump is an adequate assessment of peak power (power = force x velocity). In a small sample of athletic men and women, broad jump is correlated to maximal leg strength (Peterson et al. 2006). However, although the broad jump is correlated with muscle strength, the broad jump is not a commonly accepted assessment of muscle strength.

Regardless of the relationship between APFT/APRT tests and various test constructs (e.g., strength, endurance, agility, etc), a more compelling question is whether performance on the APFT or APRT predicts performance on common soldiering tasks. Previous research has demonstrated that, with the exception of the 2-mile run, the APFT has limitations in predicting performance on common soldiering tasks (Myers et al. 1984; Knapik et al. 1990; Harman et al. 2008). No research has examined this relationship in the APRT events. Based on face validity, it seems that APRT performance would be a better predictor of performance of common soldiering tasks than APFT performance. However, it would be prudent to validate this assumption prior to APRT implementation.

Is the APRT fair?

Response: Vanderburgh (2008) indicates that the APFT is unfair to heavier West Point cadets and ROTC cadets. However, USARIEM investigators did not find this to be true in a large sample of soldiers (Hendrickson et al. 2009). Therefore, whether height and weight bias the APFT results remains equivocal. With respect to age and gender, APFT scores are adjusted to improve “fairness” of the results. Based on the data and analysis provided by Army PRD, it seems that the APRT is no more biased than the APFT. Further analysis of the data might be required to sufficiently answer this question. Importantly, it seems that additional data will need to be collected on 40+ year olds to establish standards.

What scoring system would best ensure fairness?

Response: COA 1 is the “historical approach” to scoring and is acceptable. COA 3 also seems appropriate (everyone judged on the same scale, but required points adjusted by age/gender); this approach has the added benefit of allowing for direct comparisons of performance between age groups and genders. COA 2 (“historical approach” +10%) is arbitrary and therefore difficult to defend. COA 4 (“historical approach” for three-events and “go or no go” for the broad jump and shuttle test) would be advantageous considering the difficulty in scoring the shuttle test accurately without equipment (see comments below). Importantly, it seems that additional data will need to be collected on 40+ year olds to establish requirements.

Gaps and Concerns:

The foundation of the proposed APRT is built on guidance from SMEs and “face validity”. This is a necessary first step; however, a critical next step is establishing the criterion validity (i.e., relationship between APRT test performance and common soldiering task performance), test reliability (i.e., the ability of the test to produce consistent scores), impact of environmental conditions on test scores, etc. Further data collection would increase strength of certainty that the five-event APRT is appropriate for Army-wide implementation.

We have concerns regarding the reliability/stability of the shuttle run. The standard error of this test could be relatively large, considering that it will be hand-timed, the likelihood of between-site difference in testing surfaces, the effects of environmental conditions, etc. Relatively large random error in the measurement (likely >0.2 sec) could make meaningful differences in the outcome score, considering that merely a 0.1 sec difference is sufficient to raise/lower a soldier’s outcome score.

We have concerns about scoring the rower. Will swinging of the arms generate momentum, thus reducing the force requirements for the abdominal muscles? Could this be overcome by an alternative exercise technique?

Recommendations to Mitigate Gaps and Concerns:

The APFT was not scientifically validated prior to implementation. Instead, the APFT was implemented and subsequent research has challenged its utility and predictive validity. This mistake should not be made again. If a primary objective is to establish the relationship between the APFT/APRT and common soldiering task performance, then additional research must be conducted. Army PRD has an opportunity to further validate the APRT prior to its implementation. This would improve strength of certainty and secure buy-in from the appropriate decision-makers. We recommend that Army PRD collaborates with Army scientists to:

- 1) Determine the criterion validity of various field-expedient tests (APFT, APRT, and other candidate tests). In other words, assess the ability of various field-expedient tests (e.g., long jump, shuttle run, pull-ups, etc) to predict performance on common soldiering tasks. A large-scale investigation will answer: i) which tests are most appropriate; and ii) the minimal number of tests required to adequately assess performance on common soldiering tasks.
- 2) Determine the reliability/stability of the field-expedient tests (i.e., how much random error is associated with the measurement, the number of tests required to obtain a stable value, etc)
- 3) Determine the impact of environmental conditions, surface conditions, etc, on test results
- 4) Establish appropriate criterion-based and/or normative-based scoring systems

USARIEM Panel:

Marilyn A. Sharp, M.S.

Barry A. Spiering, Ph.D.

Bradley J. Warr, MAJ, SP, Ph.D., MPAS

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Lee E. Brown

I have evaluated all the materials sent to me by Barry A. Spiering regarding the new APRT test. My comments, suggestions and recommendations are below:

COMMENTS

According to DOD 1308.1, section 4.1.1. Physical Fitness. The Military Services shall design physical fitness training and related physical activities consistent with established scientific principles of physical conditioning that enhance fitness and general health essential to combat readiness. Individual Service members must possess the cardio-respiratory endurance, muscular strength and muscular endurance, together with desirable levels of body composition to successfully perform in accordance with their Service-specific mission and military specialty. According to DOD 1308.3, section 6.1.3.1. Military Services shall develop and use physical fitness tests (PFTs) that evaluate aerobic capacity (e.g., timed run, submaximal cycling) and muscular strength and muscular endurance (e.g., push-ups, pull-ups, sit-ups, machine tests). PFTs assess Service-wide baseline generalized fitness levels and are not intended to represent mission or occupationally specific fitness demands. Also, according to section E1.1.7. Muscular Strength. The maximal force that can be exerted in a single voluntary contraction of a skeletal muscle or skeletal muscle group. The simplest measure of strength involves various one-repetition maximum weight-lifting test (the heaviest weight that can be lifted only once). Although tests such as push-ups, pull-ups, and sit-ups measure primarily muscular endurance, there is a physiological continuum where individuals who can perform only a few repetitions of a test are completing a strength test. Thus, the pull-up, for which many individuals can complete only a few repetitions, is closer to a true strength test than push-ups.

The committee was asked to answer the five questions below (per the MEMORANDUM FOR Director, Military Performance Division, U.S. Army Research Institute of Environmental Medicine, Natick, MA 01760-5007):

2. Focus. The CG TRADOC asked that the following five questions be reviewed and answered by an external subject matter expert panel:
 - a. Is the proposed five-event APRT the right test?
 - b. Are the five events (60-yd shuttle run, 1-min rower, standing long jump, 1-min push-up w/no rest and 2-mile run) the right events?
 - c. Do these five events test what we (the Army) want to test?
 - d. Is the APRT fair?

- i. Does height affect performance?
- ii. Does weight affect performance?
- iii. Does age affect performance?
- e. What scoring system would best ensure fairness?

The resultant recommendations by the committee are the five tests below:

1. 60-yard Shuttle Run (agility)
2. 1 min Rower (muscular endurance)
3. Standing Long Jump (leg power)
4. 1 min Push-up (upper body muscular endurance)
5. 2-mile Run (cardio-respiratory endurance)

SUGGESTIONS

1. The DOD documents listed above clearly state strength is a variable of interest. However, the current recommended tests do not measure strength as it is defined by the document. The current recommended tests substitute power for strength.

2. My answers to the five questions asked of the committee below in ALL CAPS.

a. *Is the proposed five-event APRT the right test?*

NO, SINCE THEY DO NOT MEASURE STRENGTH, THEY CANNOT BE RIGHT. IN FACT THIS VIOLATES THE DOD DIRECTIVE BY SUBSTITUTING A POWER TEST (STANDING LONG JUMP) FOR THE STRENGTH TEST. I CAN ONLY ASSUME THIS IS TO SATISFY THE ARMY'S DIRECTIVE TO USE NO EQUIPMENT. HOWEVER, THIS RULE VIOLATES THE DOD DIRECTIVE 1308.1 THAT "THE MILITARY SERVICES SHALL DESIGN PHYSICAL FITNESS TRAINING AND RELATED PHYSICAL ACTIVITIES CONSISTENT WITH ESTABLISHED SCIENTIFIC PRINCIPLES..."

b. *Are the five events (60-yd shuttle run, 1-min rower, standing long jump, 1-min push-up w/no rest and 2-mile run) the right events?* ONCE AGAIN THE ANSWER MUST BE NO AS THEY DO NOT MEASURE STRENGTH, THEY MEASURE MUSCULAR ENDURANCE TWICE (1-MIN ROWER AND 1-MIN PUSH-UP TEST) AND THEY SUBSTITUTE POWER WHICH DOES NOT APPEAR IN THE DOD DIRECTIVE.

f. *Do these five events test what we (the Army) want to test?*

ONCE AGAIN NO FOR THE SAME REASONS MENTIONED ABOVE.

g. *Is the APRT fair?*

i. *Does height affect performance?*

YES, OF COURSE IT DOES AS TALL PEOPLE JUMP FURTHER THAN SHORT PEOPLE. THIS IS FURTHER VALIDATED BY LOOKING AT THE SCORES BY GENDER. MEN OUTPERFORM WOMEN IN ALL PERFORMANCE TESTS (SEE RESULTS IN THE SLIDES 'APRT BRIEF-CONE v6'). THIS IS BASIC HUMAN PHYSIOLOGY AND IS SO ROBUST A FINDING AS TO RENDER IT AXIOMATIC.

ii. Does weight affect performance? YES, OF COURSE IT DOES. SAME ANSWER AS ABOVE.

iii. Does age affect performance? YES, OF COURSE IT DOES. THIS IS BASIC HUMAN PHYSIOLOGY AND IS SO ROBUST A FINDING AS TO RENDER IT AXIOMATIC.

h. *What scoring system would best ensure fairness?* WHAT IS MEANT BY FAIRNESS? NORMATIVE OR CRITERION SCALE? THE ARMY MUST HAVE STANDARDS TO PERFORM TASKS. THEREFORE, THERE HAS TO BE CUT-OFF SCORES WHICH WOULD MEAN THE ARMY USES A CRITERION SCALE. THEN WHAT IS FAIRNESS MEAN? THAT WEAK PEOPLE ARE ALLOWED TO PASS THE TEST? IN A RELATIVE SENSE THEN, WOMEN WOULD MOST OFTEN BE CONSIDERED WEAK WHEN COMPARED TO THEIR MALE COUNTERPARTS. IN THIS SCENARIO, STANDARDIZED SCORES SUCH AS Z-SCORES WOULD BE THE BEST SCORING SYSTEM.

RECOMMENDATIONS

Based on my comments and suggestions above, I have three recommendations:

1. Delete either the rower or push-up tests as they are redundant and measure the same thing.
2. Consider deleting the standing long jump test as it measures power (not in the DOD directive) NOT strength. However, it is a useful test and may be added if time permits.
1. 3. Add at least one strength test (easy and inexpensive). My recommendations are one (upper **or** lower body strength)

or two (upper **and** lower body strength) of the three tests below:

- a. Pull-ups to failure
- b. Hand-grip dynamometer
- c. Leg dynamometer

APPENDIX F

Physical Fitness as a Predictor of Injury and Analysis of FORSCOM Pilot APRT Data USAPHC- AIPH IPP Briefing, October 2012

*Presented at the Baseline Soldier Physical Readiness Study Initial Planning Conference
2-3 OCT 12, Initial Military Training Center of Excellence; Ft Eustis VA*

This appendix includes a PowerPoint slide set that was presented by Mr. Keith Hauret from the Injury Prevention Program, USAPHC at the initial meeting for the Baseline Soldier Physical Requirements Study on 2 October 2012. This presentation has two components:

- 1) The association of the physical fitness tests and injury. Historical data from field studies and program evaluations by the Injury Prevention Program, U.S. Army Public Health Command were presented to illustrate the finding that Soldiers who perform in the lowest quartile (i.e., slowest or least number of repetitions) on the 2-mile run, 300-yard shuttle run, 2-minute push-up test, and 2-minutes sit-up test have higher injury rates compared to those who ran faster or did more push-ups or sit-ups.
- 2) Summary of the analysis of TRADOC data by the Injury Prevention Program of the pilot evaluation of the proposed Army Physical Readiness Test (APRT) and Army Combat Readiness Test (ACRT) by FORSCOM Soldiers. These tests were to be implemented Army-wide in October 2012. The slides show frequency distributions for the male and female performance on some of the events that comprised the proposed tests. On each slide, the red vertical line represents the cut-point for a 90% pass and 10% fail rate for the event using a gender-neutral standard. (Note: The scores for the current APFT events were established to allow 8% of the males and 8% of the females to fail the events using gender-specific scores (GAO, 1998)). These slides demonstrate differences in the proportion of males and females that would pass the events using a "gender-neutral standard" of the 10% fail rate applied to the overall male and female scores combined. For the existing APFT pushup and 2 mile run events, a much higher percentage of females compared with the percentage of males who would fail. The sit ups, however, do not present a gender difference. Though more substantial gender differences are seen with the pilot APRT long jump and pull up events; the gender impact is much lower for other proposed APRT events (e.g. rower, shuttle and half-mile run (~800 yards)). This suggests that use of certain events as a fitness standards may be considered 'unfair' if they are not made gender specific. Other events, such as sit ups, rower, or short runs (shuttle, $\frac{1}{2}$ mile) may be more "gender-neutral."

If tests are considered a means to assess ability to perform physical military tasks – it is necessary to determine which fitness tests are most associated with military tasks. To date the association between these fitness tests and military tasks has not been validated.

Physical Fitness As a Predictor of Injury and Analysis of FORSCOM Pilot APRT Data

USAPHC
ARMY INSTITUTE OF PUBLIC HEALTH

Bruce Jones and Keith Hauret
Army Institute of Public Health

2 October 2012

UNCLASSIFIED



Association of Physical Fitness and Injuries

Association of Two-Mile Run Time With Time-Loss Injuries in Army BCT

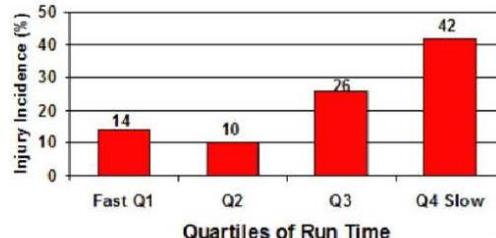
Quartiles of Two-Mile Run Times	Men (%)	Women (%)
Q1(fast)	21	38
Q2	23	54
Q3	32	62
Q4(slow)	31	60

N=682 Men, 387 Women; Risk Ratio(Q4/Q1): Men=1.5, Women=1.6
p-value for trend: Men < 0.01, Women < 0.01
Source: Knapik JJ. USACHPPM Tech Report No. 29-HE-8370-86, 1998

The Soldier Medical Readiness Campaign (RMPC) Evaluation Series UNCLAS BRIEFED



Mile Run Times and Incidence of Injury among Male Army Basic Trainees



Association of Two-Mile Run Time and Injuries in the Operational Army

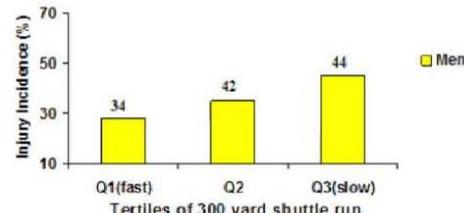
Quartiles of Two-Mile Run Times	Men (%)	Women (%)
Q1(fast)	34	52
Q2	42	56
Q3	44	67
Q4(slow)	51	57

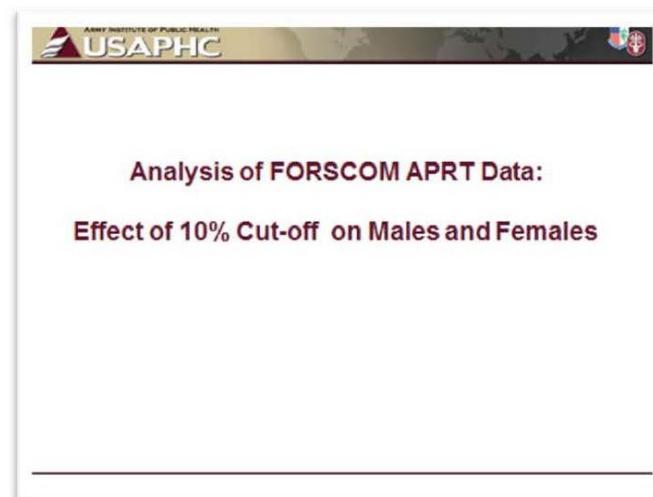
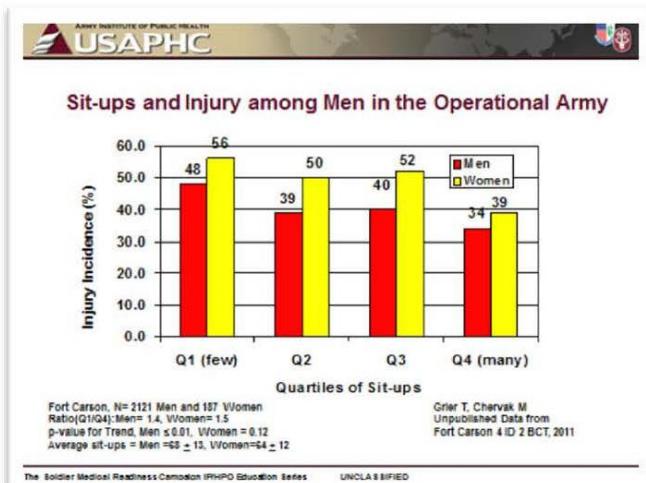
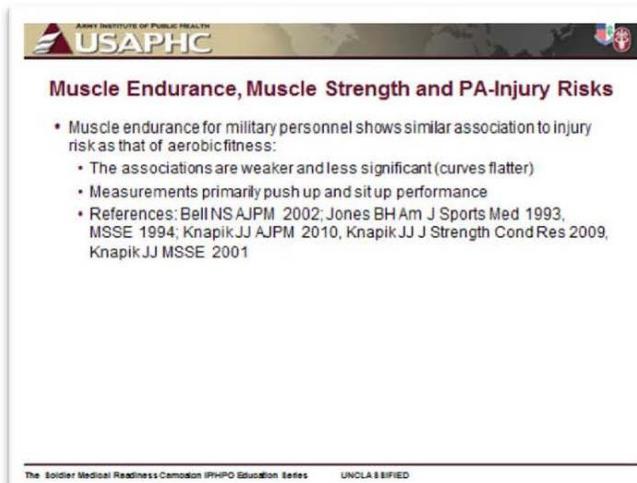
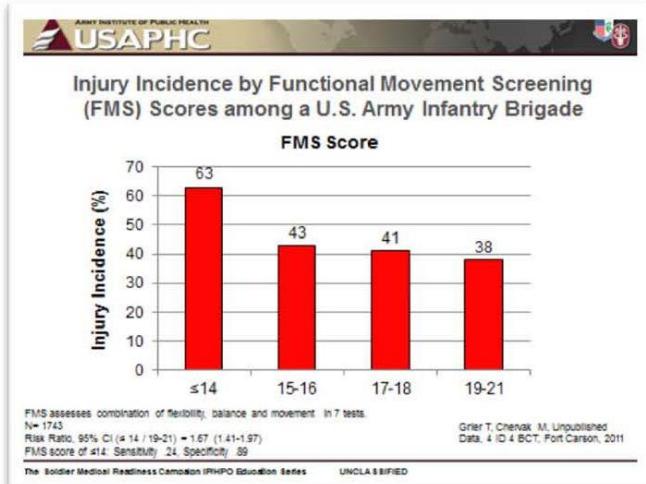
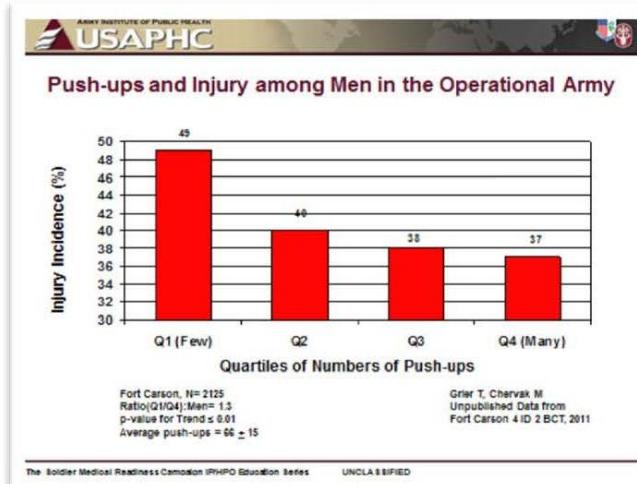
N=1248 Men, 145 Women; Risk Ratio(Q4/Q1): Men=1.5, Women=1.1
p-value for trend: Men < 0.01, Women = 0.06
Source: Grier T, Chervak M. Unpublished Data from the 25 ID 3 BCT

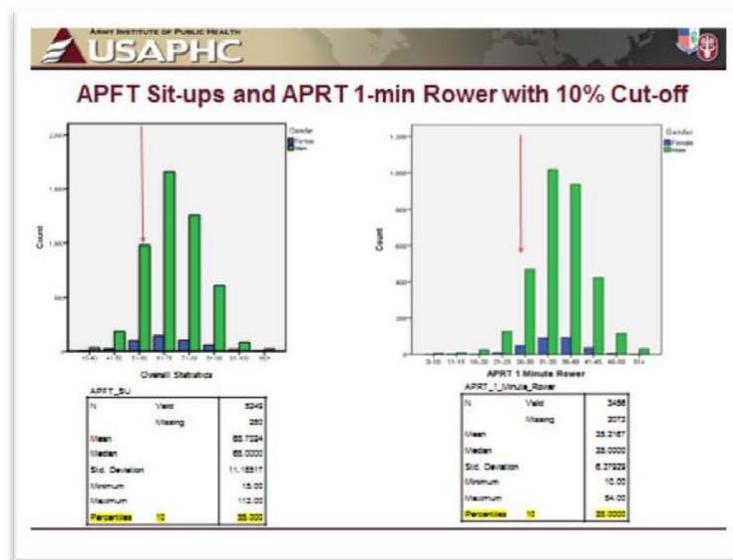
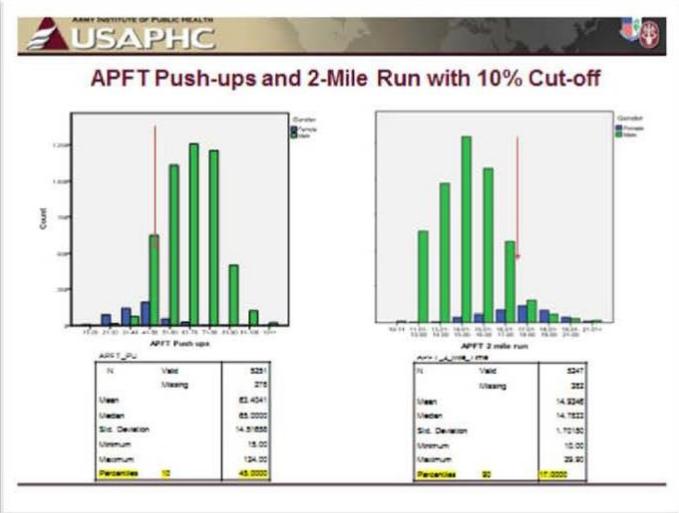
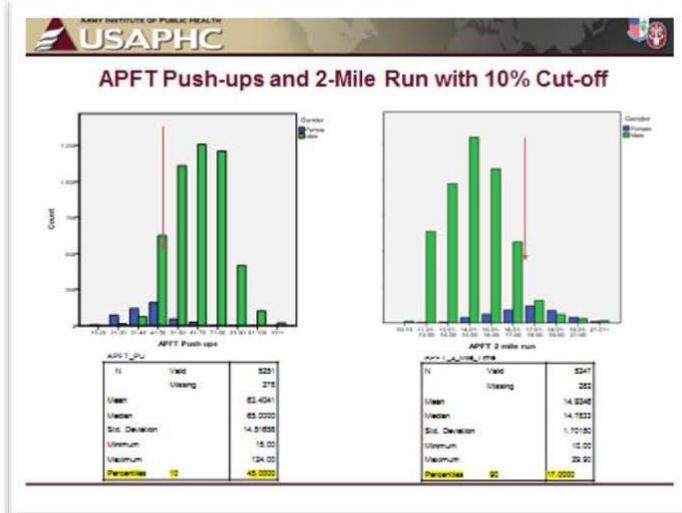
The Soldier Medical Readiness Campaign (RMPC) Evaluation Series UNCLAS BRIEFED



Association of 300 Yard Shuttle Run and Injuries in the Operational Army







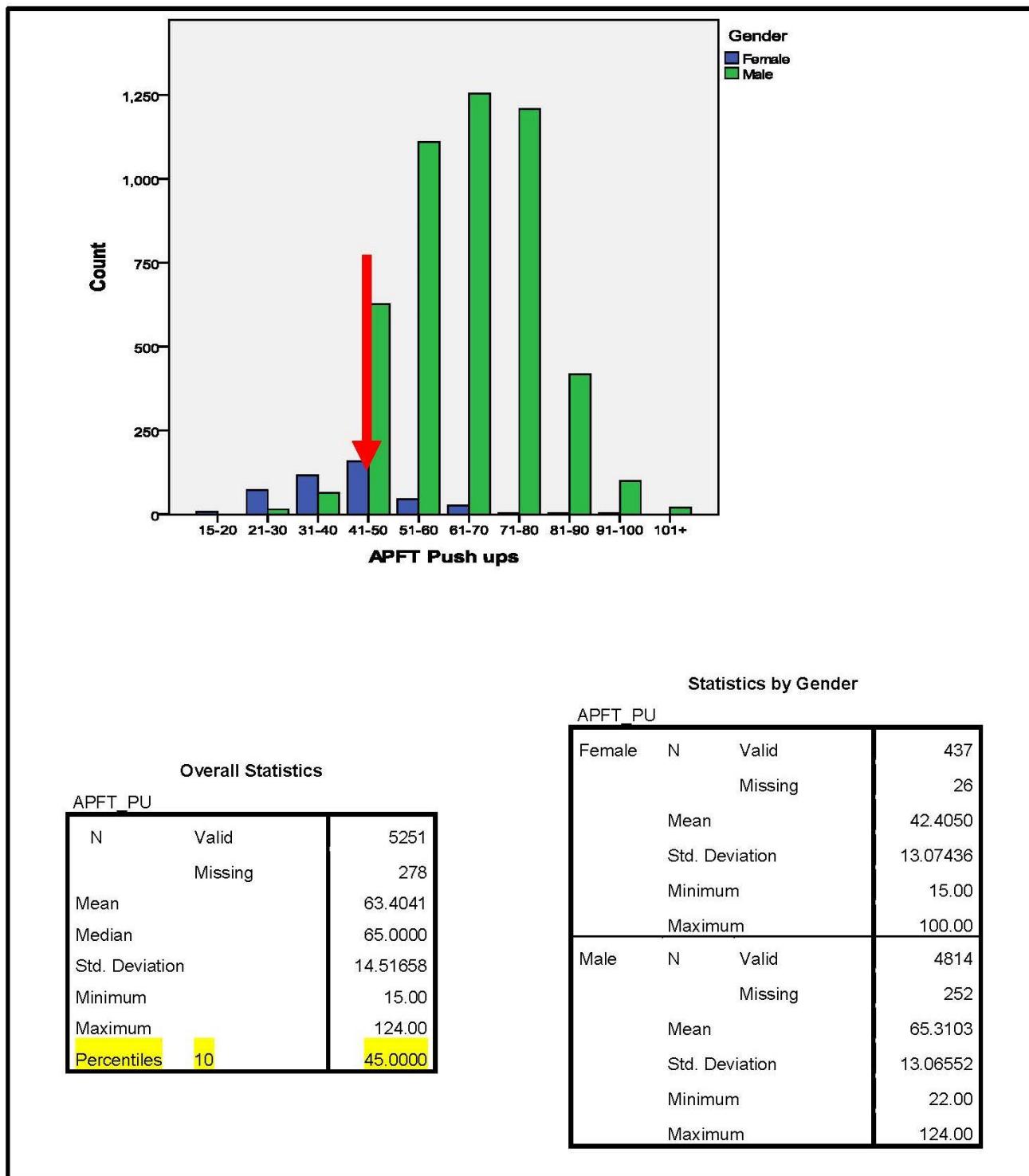


Figure F-1. FORSCOM APFT Female and Male Scores – Push Ups (“10%” Point Shown By Arrow)

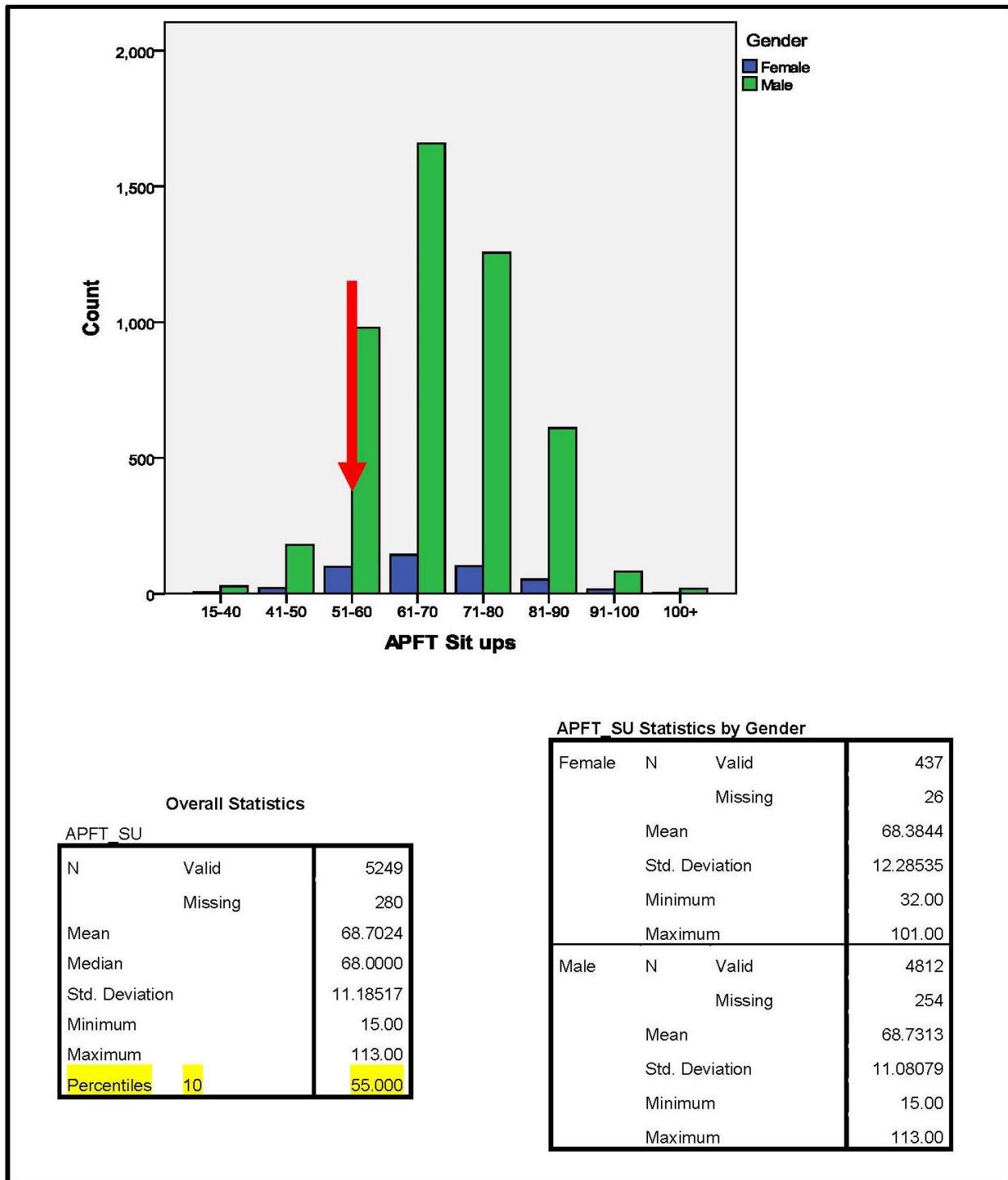


Figure F-2. FORSCOM APFT Female and Male Scores – Sit Ups (“10%” Point Shown By Arrow)

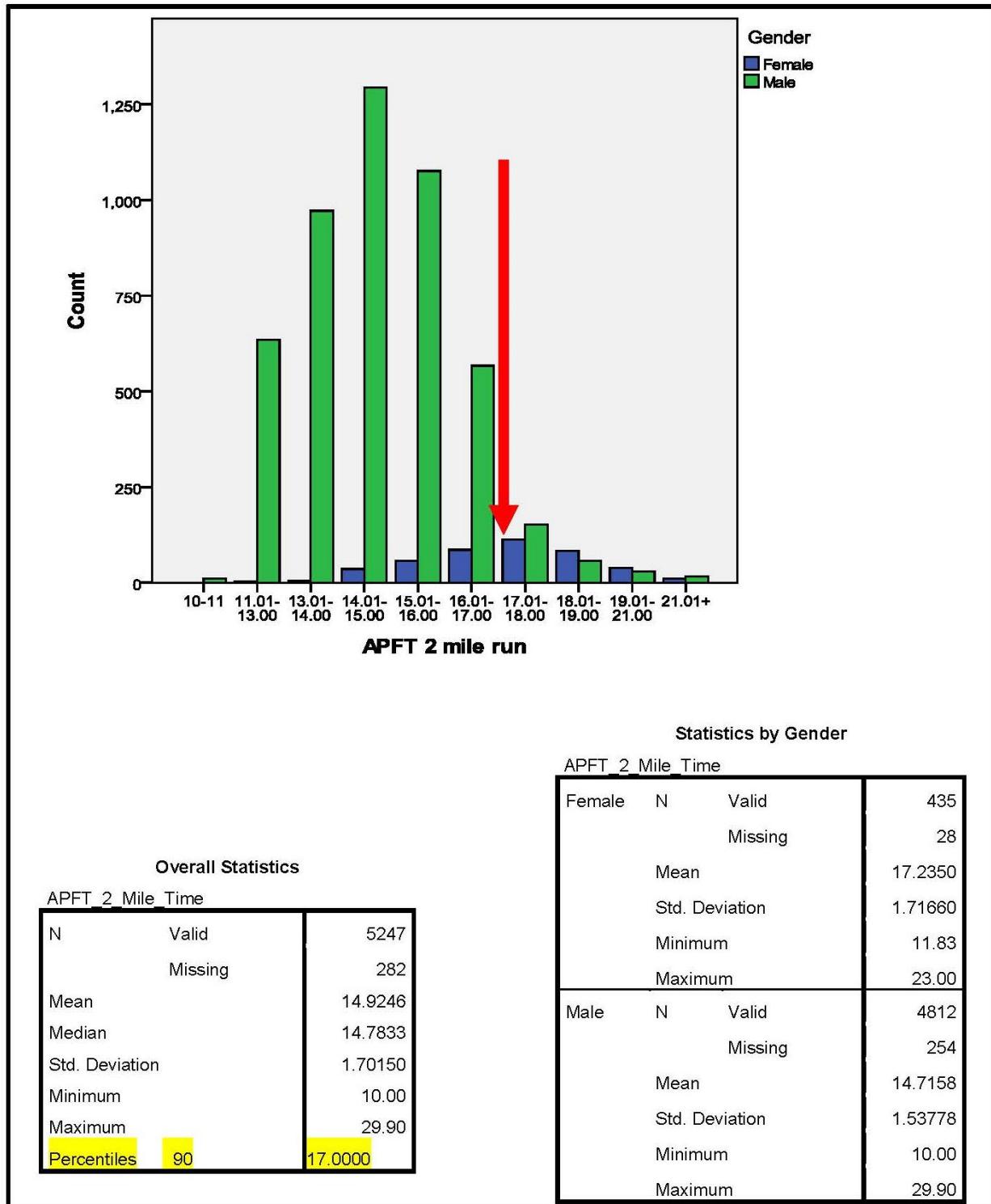


Figure F-3. FORSCOM APFT Female and Male Scores – 2Mile Run (“10%” Point Shown By Arrow)

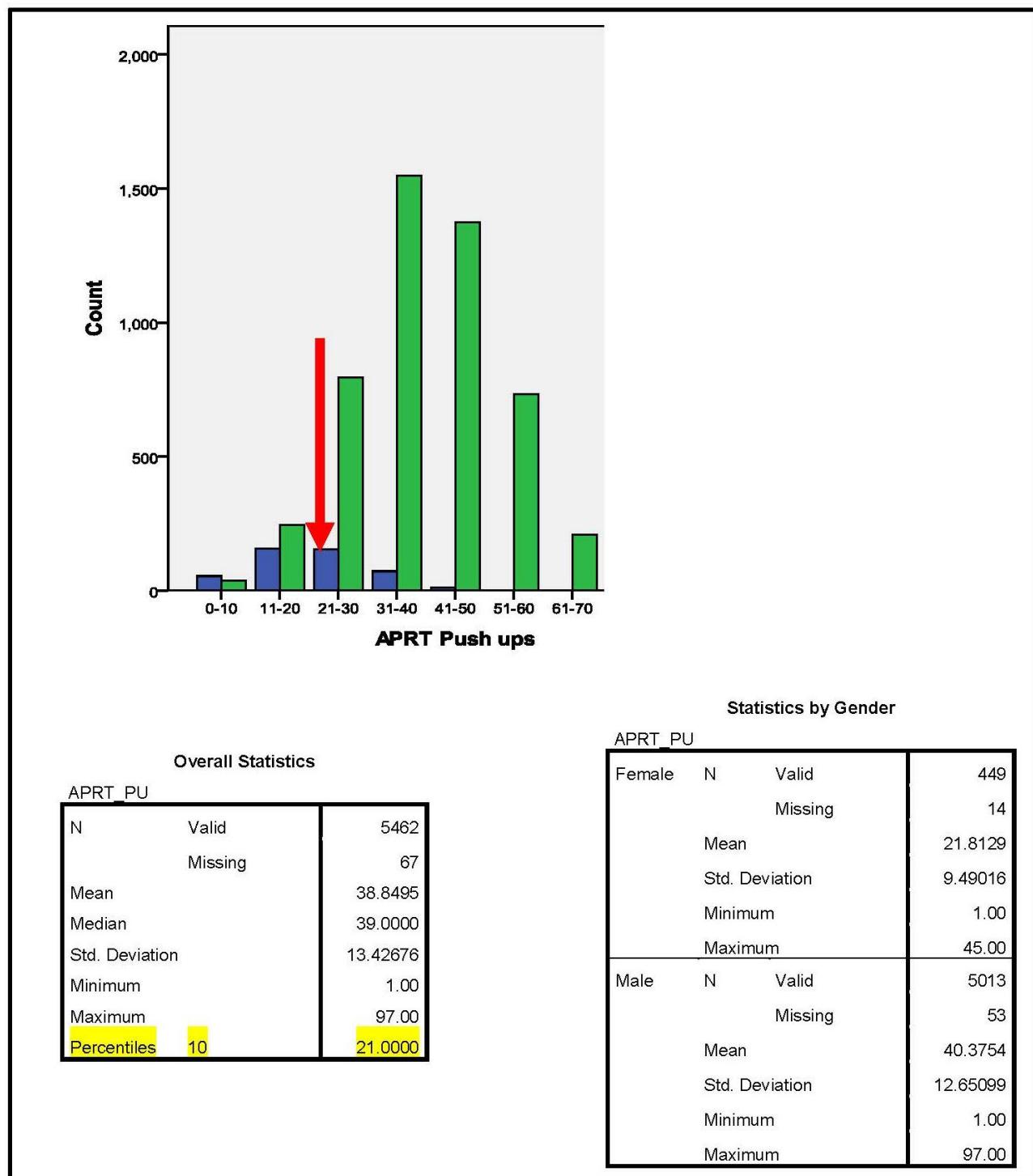


Figure F-4. FORSCOM APRT Pilot Event – Push Ups (“10%” Point Shown By Arrow)

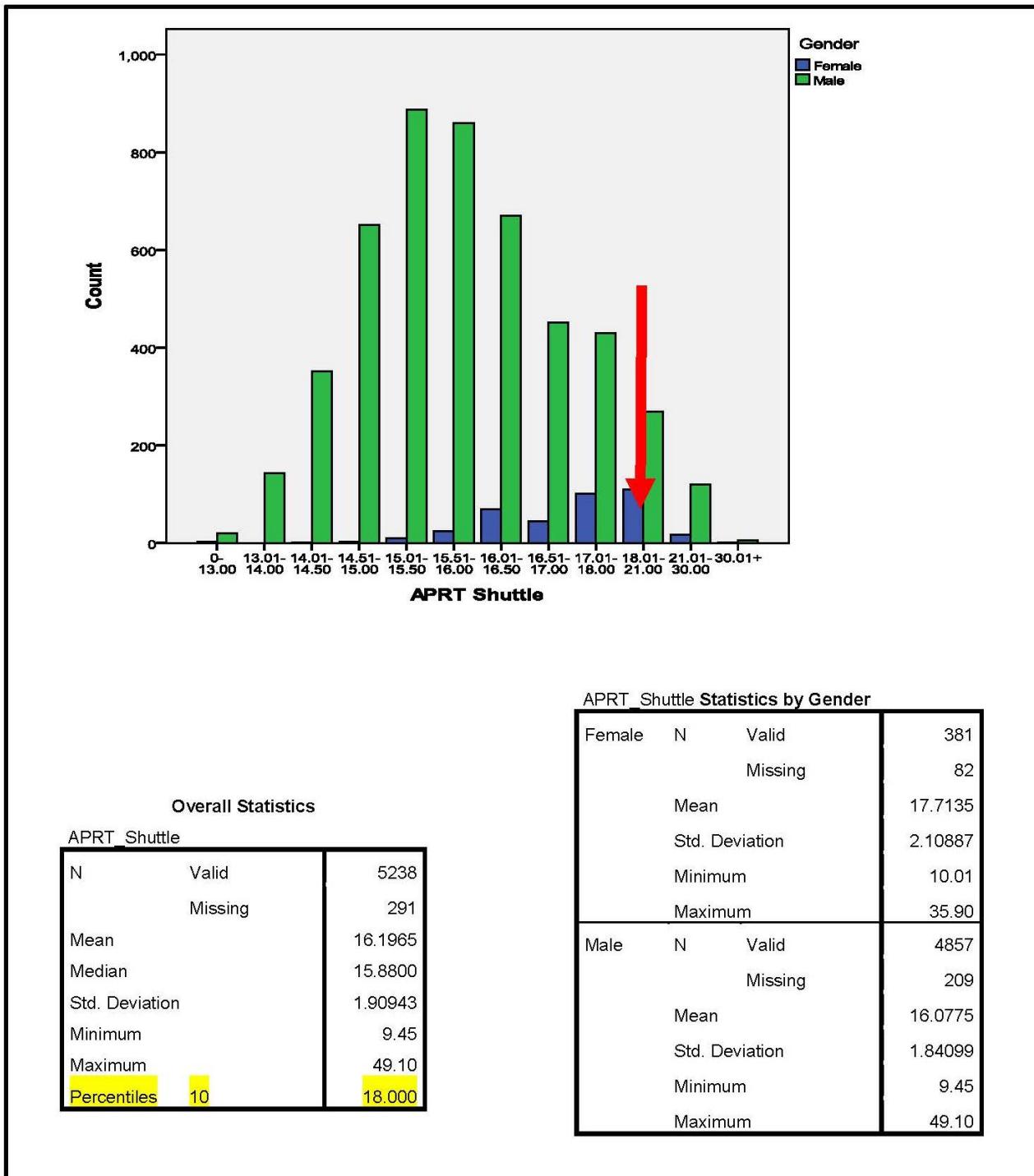


Figure F-5. FORSCOM APRT Pilot Event - Shuttle ("10%" Point Shown By Arrow)

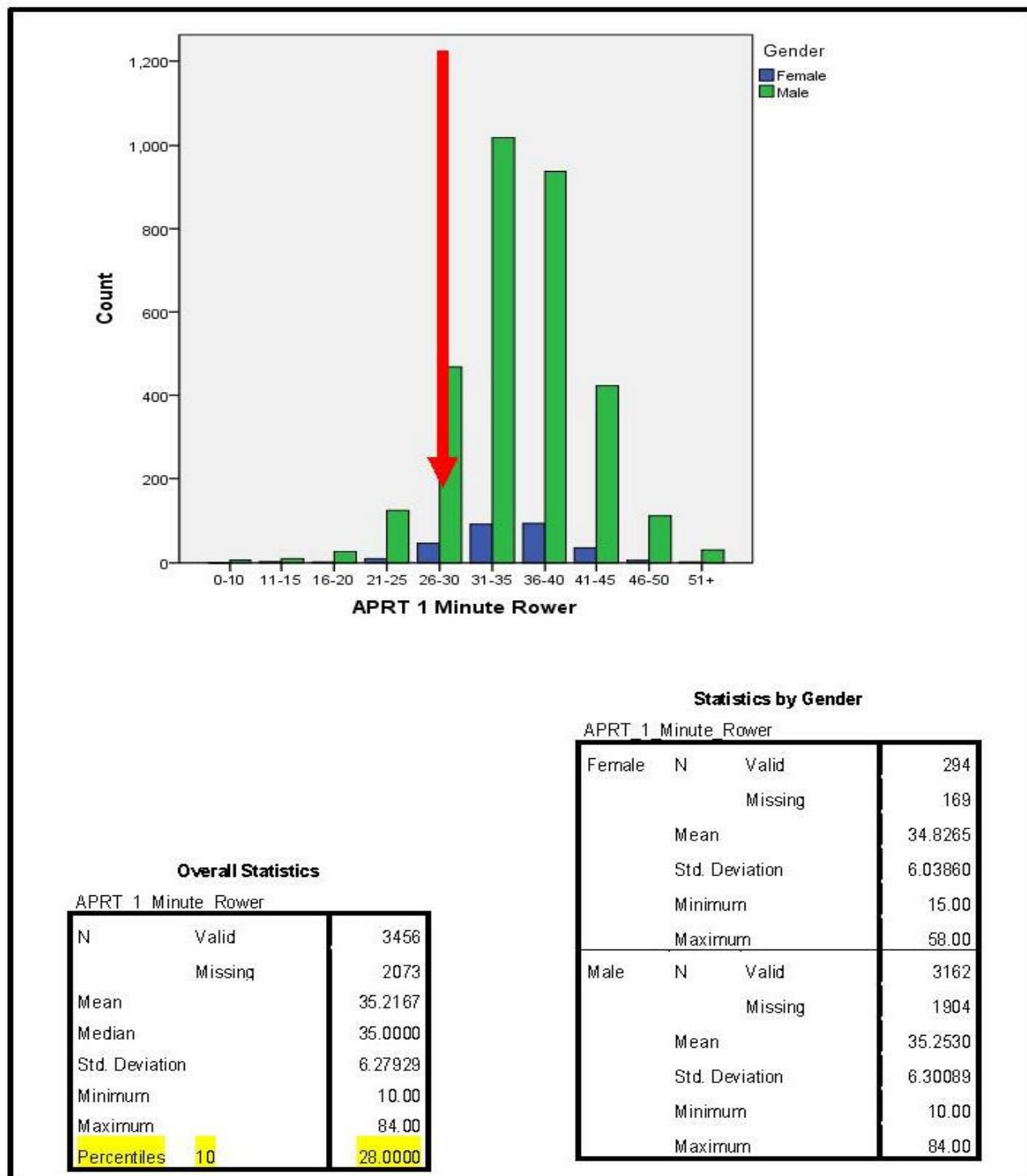
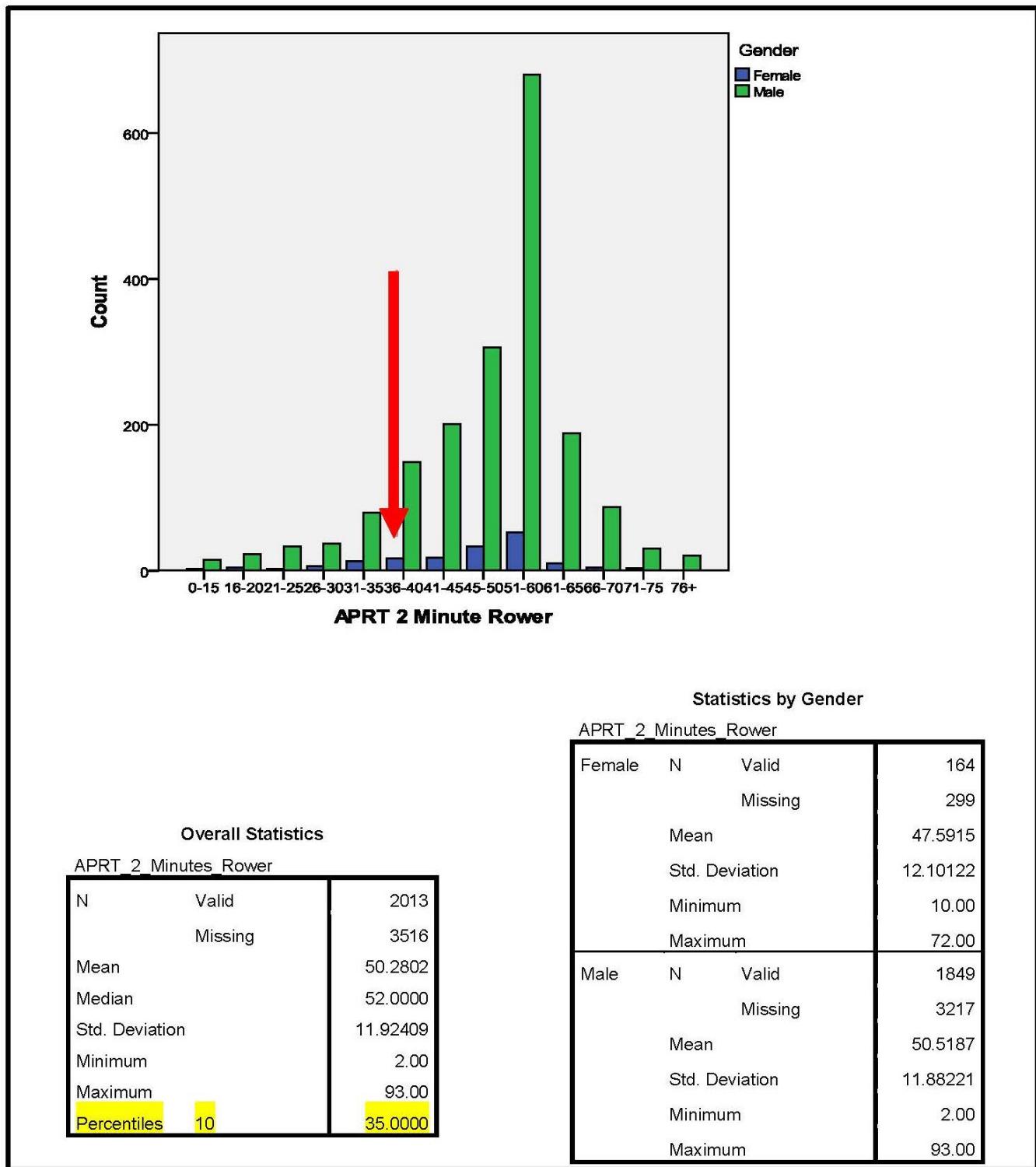


Figure F-6. FORSCOM APRT Pilot Event – 1 Minute Rower (“10% ” Point Shown By Arrow)



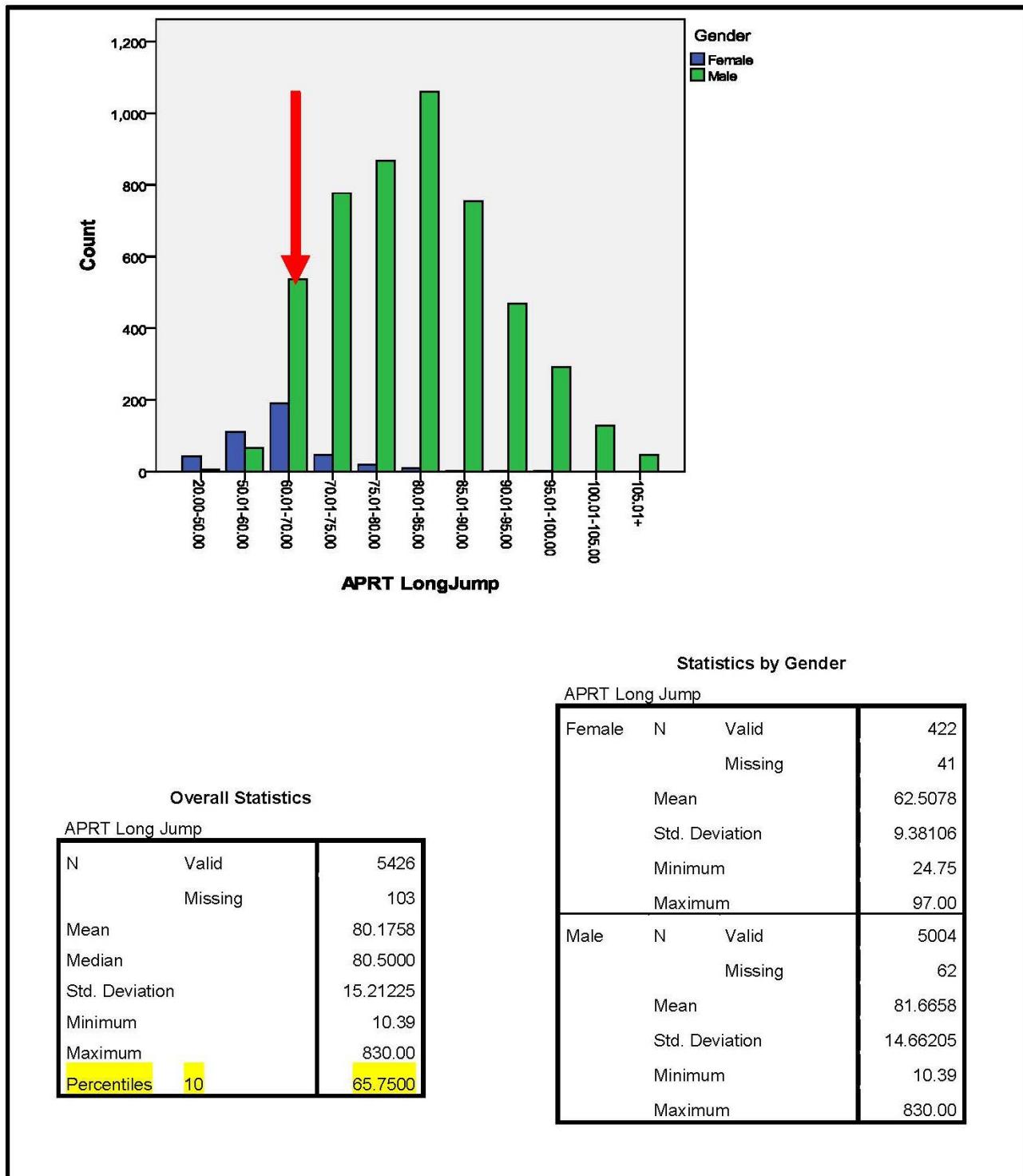


Figure F-8. FORSCOM APRT Pilot Event – Long Jump (“10%” Point Shown By Arrow)

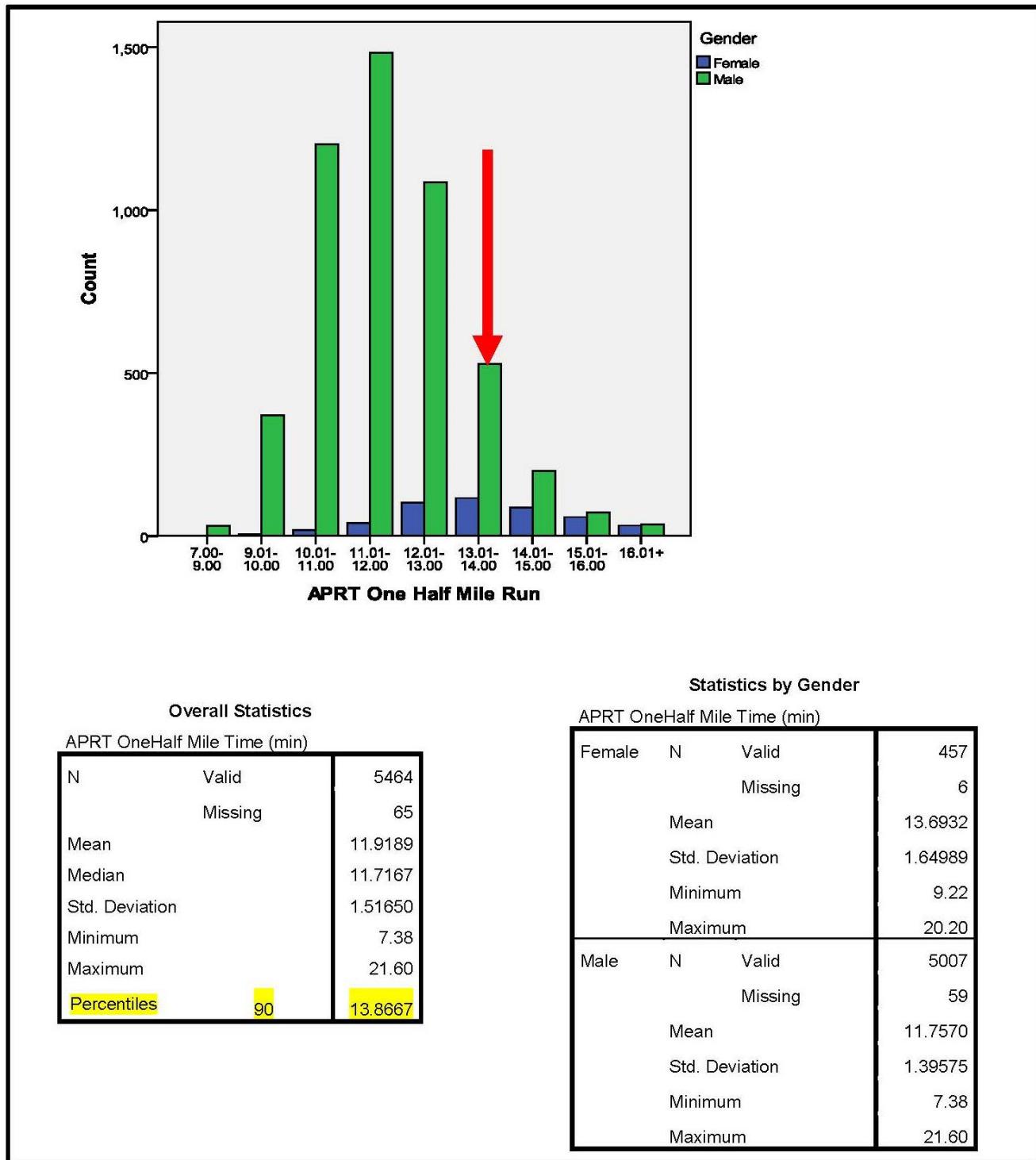


Figure F-9. FORSCOM APRT Pilot Event – ½ Mile Run (“10%” Point Shown By Arrow)

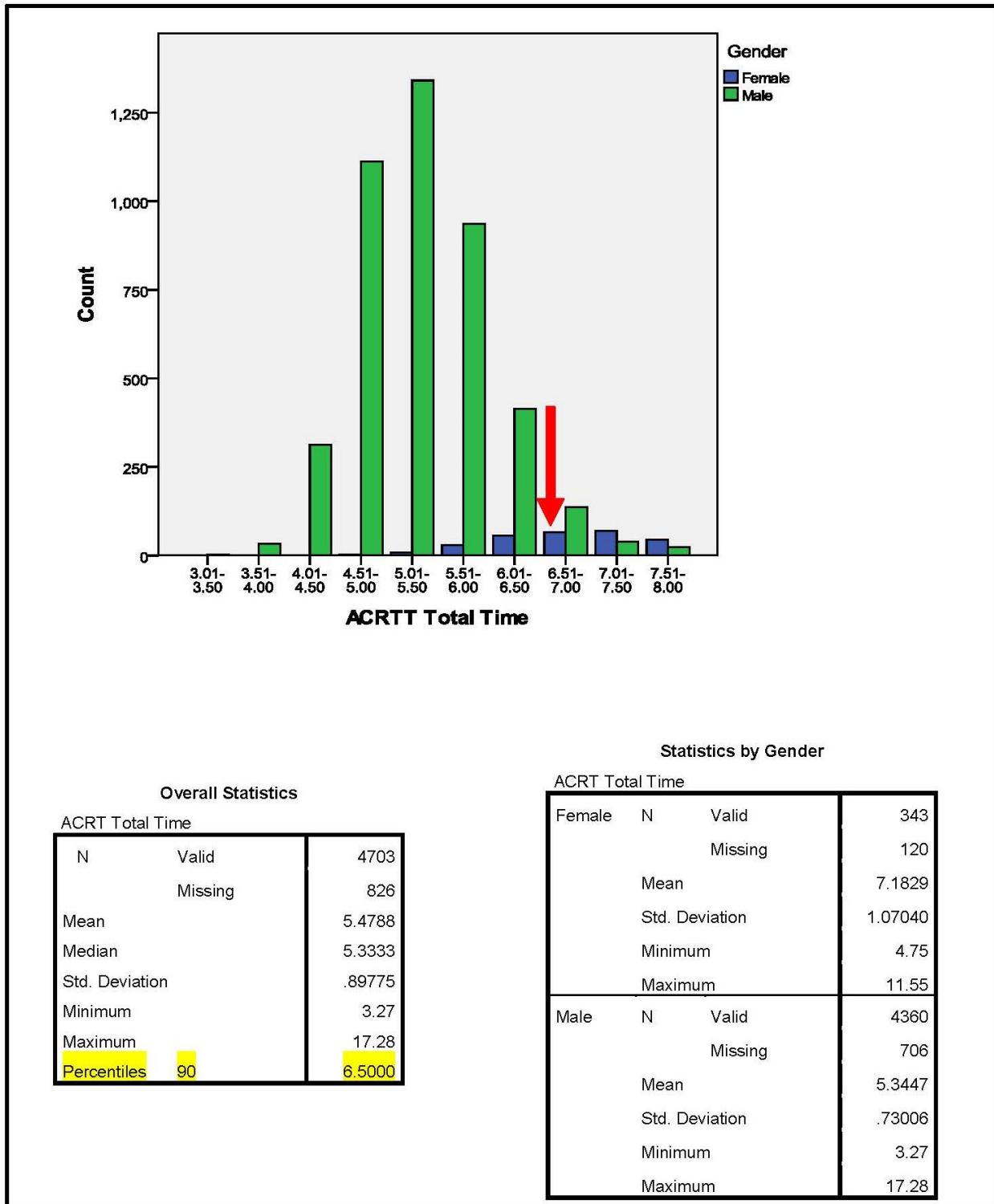


Figure F-10. FORSCOM Pilot ACRT- Total Time ("10%" Point Shown By Arrow)

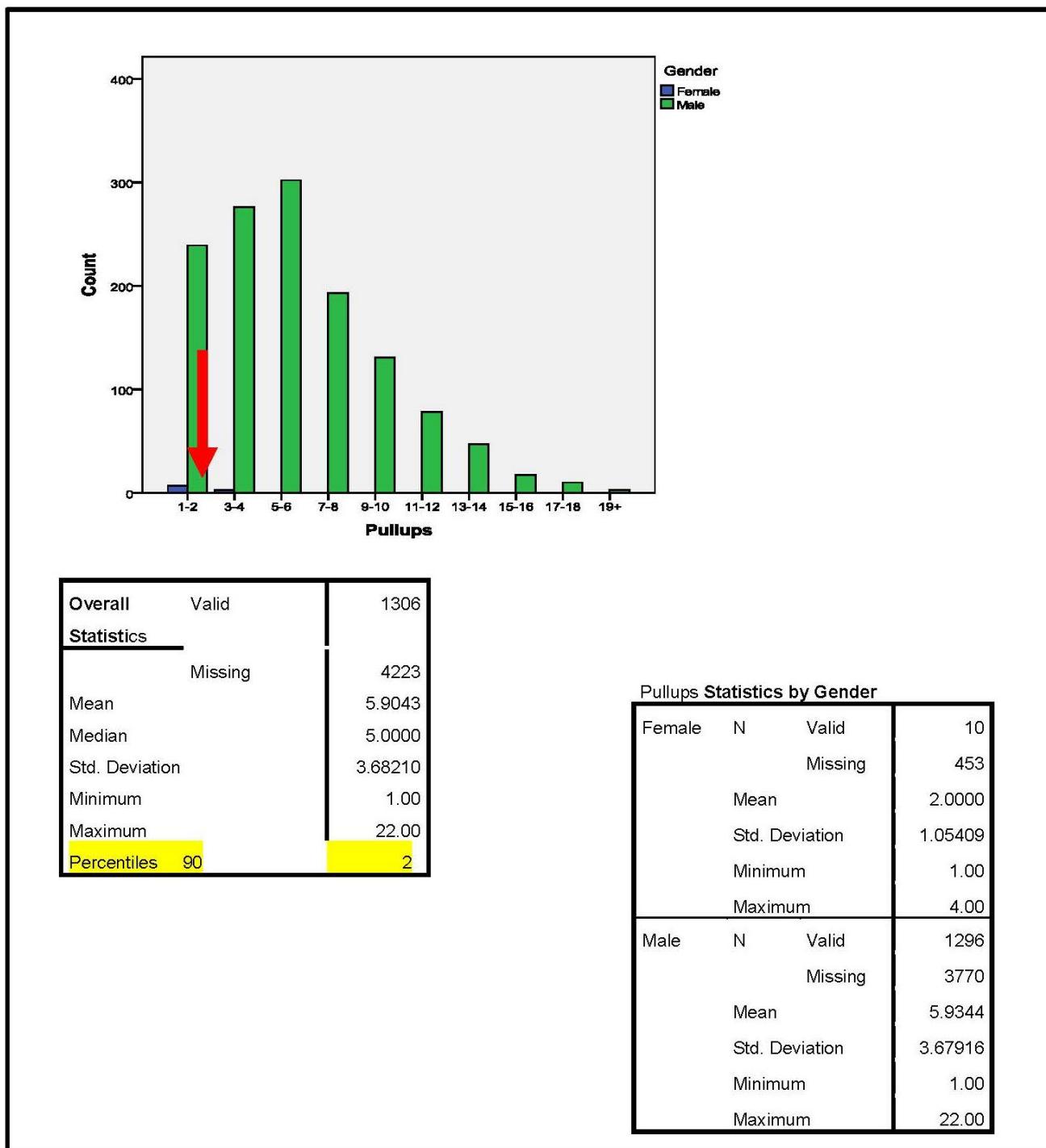


Figure F-11. FORSCOM APRT Pilot Event – Push Ups (“10%” Point Shown By Arrow)

Public Health Report No. 12-01-0614

Male & Female Combined All FORSCOM APRT ACRT													
	BMI	Body fat	APFT Push Ups	APFT Sit Ups	APFT 2 Mile run Time	APRT Push Ups	APRT Shuttle	APRT1Minute Rower	APRT 2 Minutes Rower	APRT Long Jump	APRT One and a Half Mile Run Time	ACRT Total Time	Pullups
BMI	Pearson Correlation	1	.760	-.029	-.151	.252	-.030	.076	-.087	-.135	-.045	.297	-.011
	Sig. (2-tailed)		.000	.038	.000	.000	.025	.000	.000	.000	.001	.000	.435
	N	5493	5493	5219	5218	5215	5428	5205	3437	1999	5392	5430	4675
Body fat	Pearson Correlation	.760	1	-.286	-.153	.494	-.250	.209	-.108	-.185	-.243	.483	.320
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	5493	5493	5219	5218	5215	5428	5205	3437	1999	5392	5430	4675
APFT Push Ups	Pearson Correlation	-.029	-.286	1	.507	-.507	.602	-.239	.196	.192	.300	-.406	-.397
	Sig. (2-tailed)		.038	.000	.000	.000	.000	.000	.000	.000	.000	.000	.435
	N	5219	5219	5251	5248	5242	5207	4998	3234	1979	5181	5208	4540
APFT Sit Ups	Pearson Correlation	-.151	-.153	.507	1	-.404	.309	-.129	.266	.265	.128	-.315	-.204
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	5218	5218	5248	5249	5240	5205	4997	3233	1978	5180	5206	4538
APFT 2 Mile run Time	Pearson Correlation	.252	.494	-.507	-.404	1	-.403	.233	-.191	-.231	-.281	.697	.520
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	5215	5215	5242	5240	5247	5203	4995	3236	1973	5177	5204	4538
APRT Push Ups	Pearson Correlation	-.030	-.250	.602	.309	-.403	1	-.251	.337	.313	.324	-.378	-.332
	Sig. (2-tailed)		.025	.000	.000	.000	.000	.000	.000	.000	.000	.000	.494
	N	5428	5428	5207	5205	5203	5462	5228	3456	1998	5411	5450	4642
APRT Shuttle	Pearson Correlation	.076	.209	-.239	-.129	.233	-.251	1	-.170	-.205	-.256	.257	.285
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.133
	N	5205	5205	4998	4997	4995	5228	5238	3419	1813	5223	5226	4521
APRT 1 Minute Rower	Pearson Correlation	-.087	-.108	.196	.266	-.191	.337	-.170	1	a	.127	-.257	-.180
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000			.000	.000	.
	N	3437	3437	3234	3233	3236	3456	3419	3456	0	3411	3456	2995
APRT 2 Minutes Rower	Pearson Correlation	-.135	-.185	.192	.265	-.231	.313	-.205	a		1	.167	-.287
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000				.000	-.183
	N	1999	1999	1979	1978	1973	1998	1813	0	2013	2009	2000	1263
APRT Long Jump	Pearson Correlation	-.045	-.243	.300	.128	-.281	.324	-.256	.127	.167	1	-.255	-.469
	Sig. (2-tailed)		.001	.000	.000	.000	.000	.000	.000	.000	.000	.000	.261
	N	5392	5392	5181	5180	5177	5411	5223	3411	2009	5426	5413	4638
APRT One and a Half Mile Run Time	Pearson Correlation	.297	.483	-.406	-.315	.697	-.378	.257	-.257	-.287	-.255	1	.516
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.262
	N	5430	5430	5208	5206	5204	5450	5226	3456	2000	5413	5464	4641
ACRT Total Time	Pearson Correlation	-.011	.320	-.397	-.204	.520	-.332	.285	-.180	-.183	-.469	.516	1
	Sig. (2-tailed)		.435	.000	.000	.000	.000	.000	.000	.000	.000	.000	.
	N	4675	4675	4540	4538	4538	4642	4521	2995	1650	4638	4641	4703
Pullups	Pearson Correlation	-.167	-.180	.435	.298	-.277	.494	-.133	a		.223	.261	-.262
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000			.000	.000	.
	N	1296	1296	1278	1277	1276	1266	1181	0	1263	1266	1261	1297
Strength of relationship													
	Strong	(-1.0 to -0.5 or 1.0 to 0.5)											
	Moderate	(-0.5 to -0.3 or 0.3 to 0.5)											
	Blank	Weak or none (-0.3 to -0.1 or 0.1 to 0.3)											

Public Health Report No. 12-01-0614

Male All FORSCOM APRT ACRT														
		BMI	Body fat	APFT Push Ups	APFT Sit Ups	APFT 2 Mile run Time	APRT Push Ups	APRT Shuttle	APRT 1 Minute Rower	APRT 2 Minutes Rower	APRT Long Jump	APRT One and a Half Mile Run Time	ACRT Total Time	Pullups
BMI	Pearson Correlation	1	.958	-.103	-.166	.348	-.087	.116	-.086	-.150	-.100	.383	.103	-.172
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	5030	5030	4782	4781	4780	4979	4824	3143	1835	4970	4973	4332	1286
Body fat	Pearson Correlation	.958	1	-.096	-.175	.381	-.079	.128	-.109	-.179	-.106	.391	.132	-.167
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	5030	5030	4782	4781	4780	4979	4824	3143	1835	4970	4973	4332	1286
APFT Push Ups	Pearson Correlation	-.103	-.096	1	.572	-.405	.536	-.165	.204	.178	.185	-.293	-.235	.430
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4782	4782	4814	4811	4807	4781	4628	2960	1818	4771	4774	4205	1268
APFT Sit Ups	Pearson Correlation	-.156	-.175	.572	1	-.435	.334	-.136	.257	.267	.136	-.324	-.240	.300
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4781	4781	4811	4812	4805	4779	4627	2959	1817	4770	4772	4203	1267
APFT 2 Mile run Time	Pearson Correlation	.348	.381	-.405	-.435	1	-.296	.161	-.187	-.222	-.171	.641	.401	-.267
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4780	4780	4807	4805	4812	4779	4627	2963	1813	4769	4772	4205	1266
APRT Push Ups	Pearson Correlation	-.087	-.079	.536	.334	-.296	1	-.192	.360	.318	.230	-.284	-.191	.489
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4979	4979	4781	4779	4779	5013	4852	3162	1843	4998	5002	4308	1256
APRT Shuttle	Pearson Correlation	.116	.128	-.165	-.136	.161	-.192	1	-.175	-.205	-.194	.203	.206	-.128
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4824	4824	4628	4627	4627	4852	4857	3159	1692	4844	4846	4214	1173
APRT 1 Minute Rower	Pearson Correlation	-.086	-.109	.204	.257	-.187	.360	-.175	1	a	.127	-.255	-.216	a
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	a	.000	.000	.000	.
	N	3143	3143	2960	2959	2963	3162	3159	3162	0	3153	3162	2775	0
APRT 2 Minutes Rower	Pearson Correlation	-.150	-.179	.178	.267	-.222	.318	-.205	a	1	.150	-.264	-.166	.222
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	a	1	.000	.000	.000	.000
	N	1835	1835	1818	1817	1813	1843	1692	0	1849	1845	1837	1532	1253
APRT Long Jump	Pearson Correlation	-.100	-.106	.185	.136	-.171	.230	-.194	.127	.150	1	-.161	-.317	.252
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	1	.000	.000	.000	.000
	N	4970	4970	4771	4770	4769	4998	4844	3153	1845	5004	4992	4301	1256
APRT One and a Half Mile Run Time	Pearson Correlation	.383	.391	-.293	-.324	.641	-.284	.203	-.255	-.264	-.161	1	.418	-.252
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4973	4973	4774	4772	4772	5002	4846	3162	1837	4992	5007	4303	1251
ACRT Total Time	Pearson Correlation	.103	.132	-.235	-.240	.401	-.191	.206	-.216	-.166	-.317	.418	1	-.132
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4332	4332	4205	4203	4205	4308	4214	2775	1532	4301	4303	4360	1287
Pullups	Pearson Correlation	-.172	-.167	.430	.300	-.267	.489	-.128	a	.222	.252	-.252	-.132	1
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	a	.000	.000	.000	.000	.
	N	1286	1286	1268	1267	1266	1256	1173	0	1253	1256	1251	1267	1296
Strength of relationship														
	Strong	(-1.0 to -0.5 or 1.0 to 0.5)												
	Moderate	(-0.5 to -0.3 or 0.3 to 0.5)												
	Blank	Weak or none (-0.3 to -0.1 or 0.1 to 0.3)												

Public Health Report No. 12-01-0614

Female All FORSCOM APRT ACRT														
	BMI	Bodfat	APFT Push Ups	APFT Sit Ups	APFT 2 Mile Run Time	APRT Push Ups	APRT Shuttle	APRT 1 Minute Rower	APRT 2 Minutes Rower	APRT Long Jump	APRT One and a Half Mile Run Time	ACRT Total Time	Pullups	
BMI	Pearson Correlation	1	.946	-.058	-.132	.258	-.131	.038	-.139	-.100	-.077	.275	-.114	-.056
	Sig. (2-tailed)		.000	.229	.006	.000	.005	.454	.017	.202	.115	.000	.036	.878
	N	463	463	437	437	435	449	381	294	164	422	457	343	10
Body fat	Pearson Correlation	.946	1	-.045	-.132	.251	-.107	.082	-.171	-.108	-.066	.271	-.095	-.117
	Sig. (2-tailed)	.000			.348	.006	.000	.023	.109	.003	.169	.174	.000	.079
	N	463	463	437	437	435	449	381	294	164	422	457	343	10
APFT Push Ups	Pearson Correlation	-.058	-.045	1	.439	-.352	.400	-.150	.266	.240	.181	-.359	-.180	.448
	Sig. (2-tailed)	.229	.348		.000	.000	.000	.004	.000	.002	.000	.000	.001	.194
	N	437	437	437	437	435	426	370	274	161	410	434	335	10
APFT Sit Ups	Pearson Correlation	-.132	-.132	.439	1	-.470	.314	-.104	.357	.245	.147	-.418	-.235	.360
	Sig. (2-tailed)	.006	.006	.000		.000	.000	.046	.000	.002	.003	.000	.000	.306
	N	437	437	437	437	435	426	370	274	161	410	434	335	10
APFT 2 Mile run Time	Pearson Correlation	.258	.251	-.352	.470	1	-.337	.172	-.326	-.282	-.194	.697	.403	-.251
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.001	.000	.000	.000	.000	.000	.484
	N	435	435	435	435	435	424	368	273	160	408	432	333	10
APRT Push Ups	Pearson Correlation	-.131	-.107	.400	.314	-.337	1	-.175	.340	.315	.242	-.304	-.124	.800
	Sig. (2-tailed)	.005	.023	.000	.000	.000		.001	.000	.000	.000	.000	.023	.005
	N	449	449	428	426	424	449	376	294	155	413	448	334	10
APRT Shuttle	Pearson Correlation	.038	.082	-.150	-.104	.172	-.175	1	-.149	-.181	-.352	.176	.263	-.362
	Sig. (2-tailed)	.454	.109	.004	.046	.001	.001		.016	.047	.000	.001	.000	.378
	N	381	381	370	370	368	376	381	260	121	379	380	307	8
APRT 1 Minute Rower	Pearson Correlation	-.139	-.171	.266	.357	-.326	.340	-.149	1	a	.236	-.390	-.273	a
	Sig. (2-tailed)	.017	.003	.000	.000	.000	.000	.016		.000	.000	.000	.000	
	N	294	294	274	274	273	294	260	294	0	258	294	220	0
APRT 2 Minutes Rower	Pearson Correlation	-.100	-.108	.240	.245	-.282	.315	-.181	a	1	.193	-.464	-.324	.303
	Sig. (2-tailed)	.202	.169	.002	.002	.000	.000	.047		.014	.000	.000	.000	.394
	N	164	164	161	161	160	155	121	0	164	164	163	118	10
APRT Long Jump	Pearson Correlation	-.077	-.066	.181	.147	-.194	.242	-.352	.236	.193	1	-.179	-.281	-.255
	Sig. (2-tailed)	.115	.174	.000	.003	.000	.000	.000	.000	.014		.000	.000	.478
	N	422	422	410	410	408	413	379	258	164	422	421	337	10
APRT One and a Half Mile Run Time	Pearson Correlation	.275	.271	-.359	-.418	.697	-.304	.176	-.390	-.464	-.179	1	.473	-.324
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.001	.000	.000		.000	.000	.361
	N	457	457	434	434	432	448	380	294	163	421	457	338	10
ACRT Total Time	Pearson Correlation	-.114	-.095	-.180	-.235	.403	-.124	.263	-.273	-.324	-.281	.473	1	-.072
	Sig. (2-tailed)	.036	.079	.001	.000	.000	.023	.000	.000	.000	.000	.000		.844
	N	343	343	335	335	333	334	307	220	118	337	338	343	10
Pullups	Pearson Correlation	-.056	-.117	.448	.360	-.251	.800	-.362	a		.303	-.255	-.324	-.072
	Sig. (2-tailed)	.878	.747	.194	.306	.484	.005	.378		.394	.478	.361	.844	
	N	10	10	10	10	10	8	0	10	10	10	10	10	10

Strength of relationship

Strong	(-1.0 to -0.5 or 1.0 to 0.5)
Moderate	(-0.5 to -0.3 or 0.3 to 0.5)
Blank	Weak or none (-0.3 to -0.1 or 0.1 to 0.3)

APPENDIX G

Analyses of Existing APFT Data from 2nd Brigade Combat Team, 4th Infantry Division

USAPHC- AIPH IPP preliminary background analyses: comparison of male and female APFT data

If the current APFT were to be gender neutral (e.g., just have one scale for both men and women with an 8%* fail rate), we would want to know how this would affect men and women of different age groups. To determine the percentage of men and women who would fail within these specific age groups, charts were plotted showing the total population compared to either men or women in their specific age group. Tables of injury risk are also included showing that men who perform poorly on the 2-mile run and push-up test were at a higher risk of injury. There were no difference in injury risk for women and the number of push-ups performed. The women in the fastest 2-mile run time group tended to have a lower injury risk compared to the other groups.

Table G-1. Summary of Men and Women Compared to the Total Population who would Fail using an 8% Cut-off Point

Age	% Failed 2-mile run	% Failed 2-mile run	% Failed Push-ups	% Failed Push-ups
	Women	Men	Women	Men
≤ 25	51%	3%	60%	2%
26-35	55%	5%	60%	3%
36+	44%	11%	62%	7%

*** 8 % is used since that is the current cut-point applied to gender-specific APFT results (GAO, 1998)**

All Analyses are of Existing survey data obtained from the 4 ID 2BCT

Table G-2. Averages for Men and Women from existing 4 ID 2BCT Initial Survey Data

	Men	Women	Difference
Age	26.8± 6.0	25.8± 5.6	4%
2 Mile Run Time	14.9± 1.7	17.8± 2.2	19%
Push-Ups	66.2± 14.7	38.5± 13.9	72%
Sit-Ups	68.0± 12.8	64.1± 12.2	6%

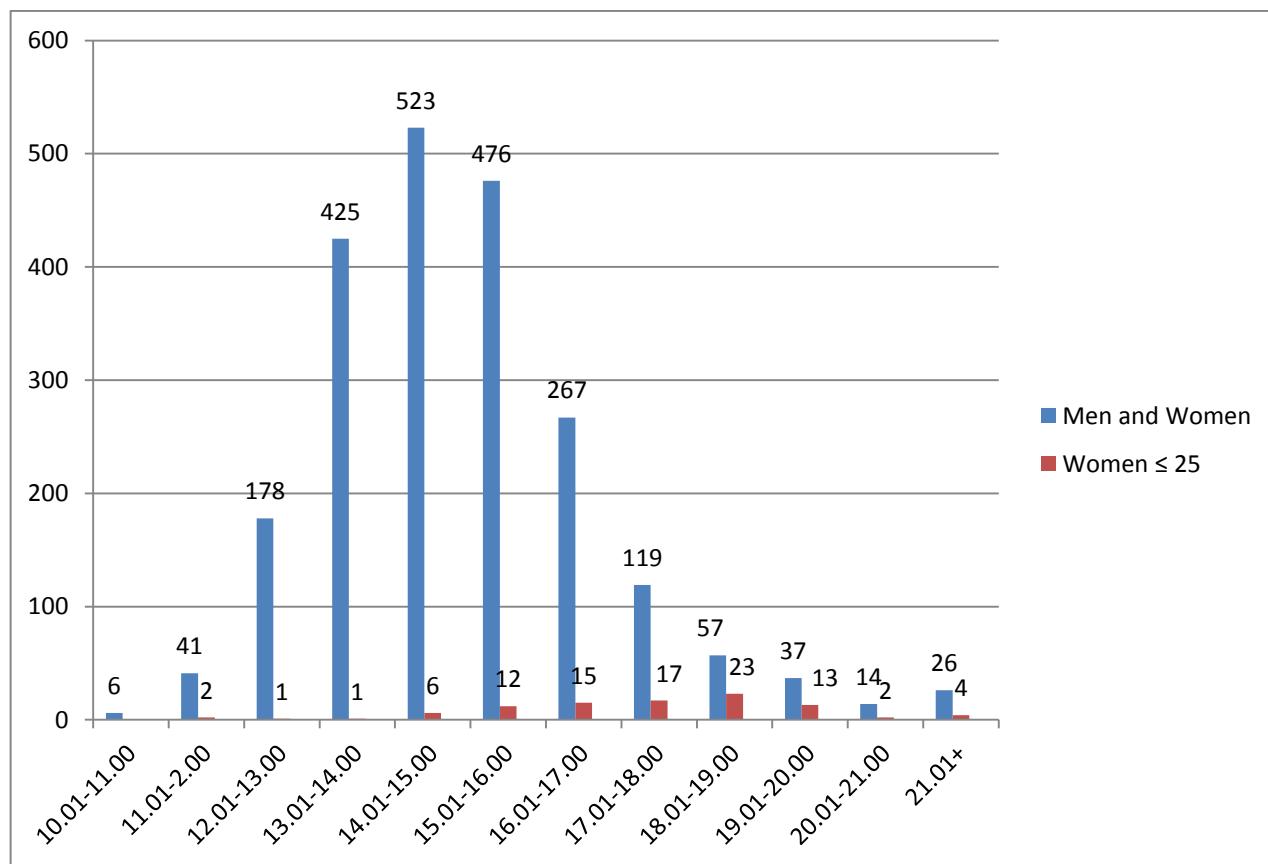


Figure G-1. Two Mile Run Times for Men and Women (n=2169) and Women ≤ 25 years old (n=96)

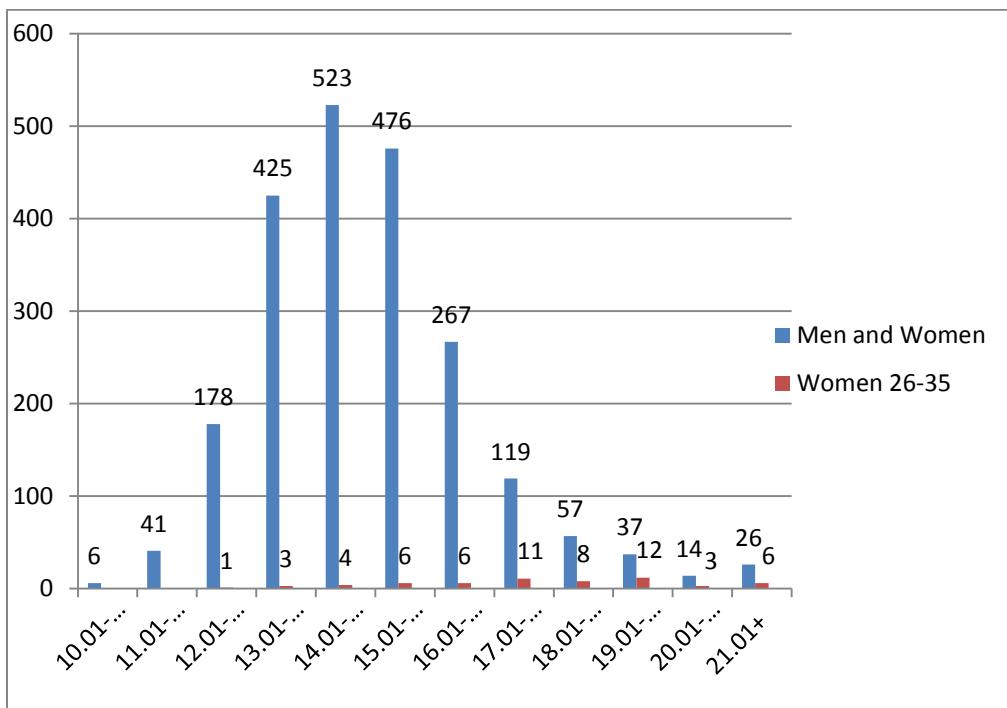


Figure G-2. Two Mile Run Times for Men and Women (n=2169) and Women 26-35 years old (n=60)

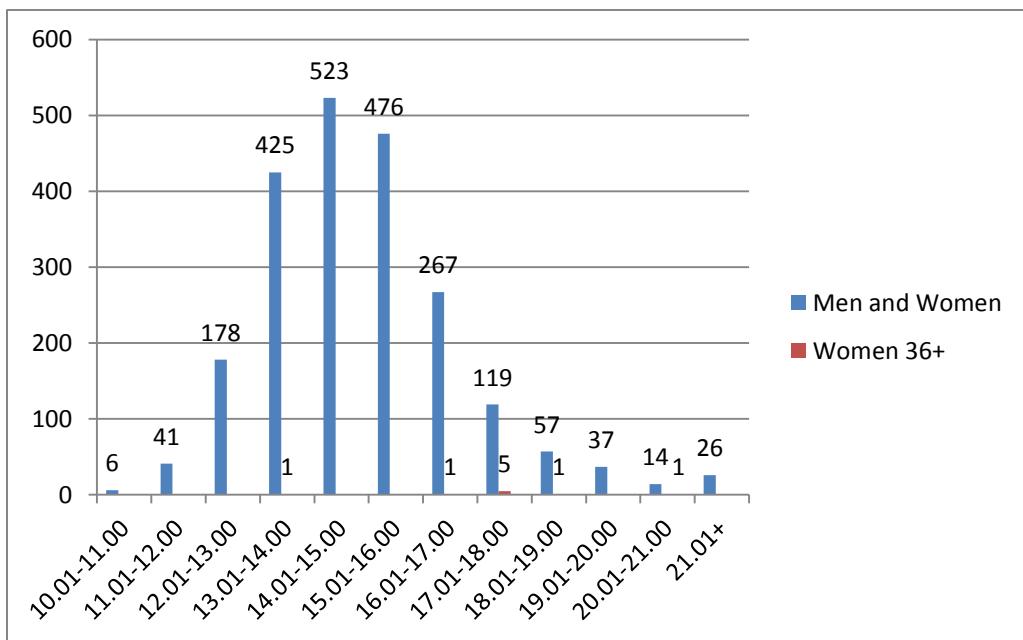


Figure G-3. Two Mile Run Times for Men and Women (n=2169) and Women 36+ years old (n=9)

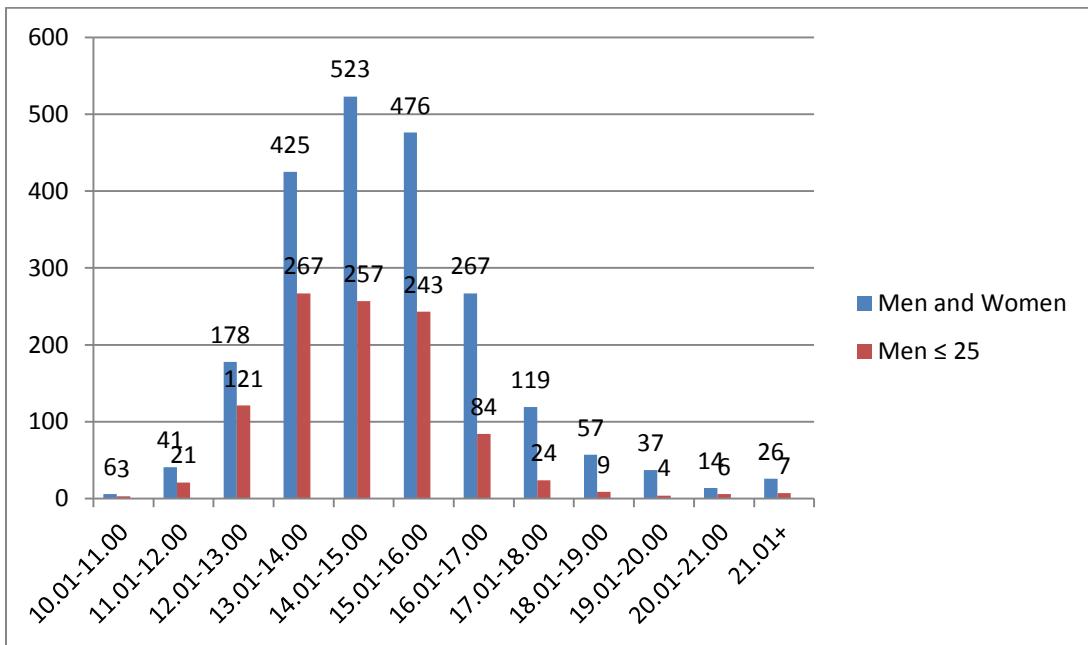


Figure G-4. Two Mile Run Times for Men and Women (n=2169) and Men ≤ 25 years (n=1046)

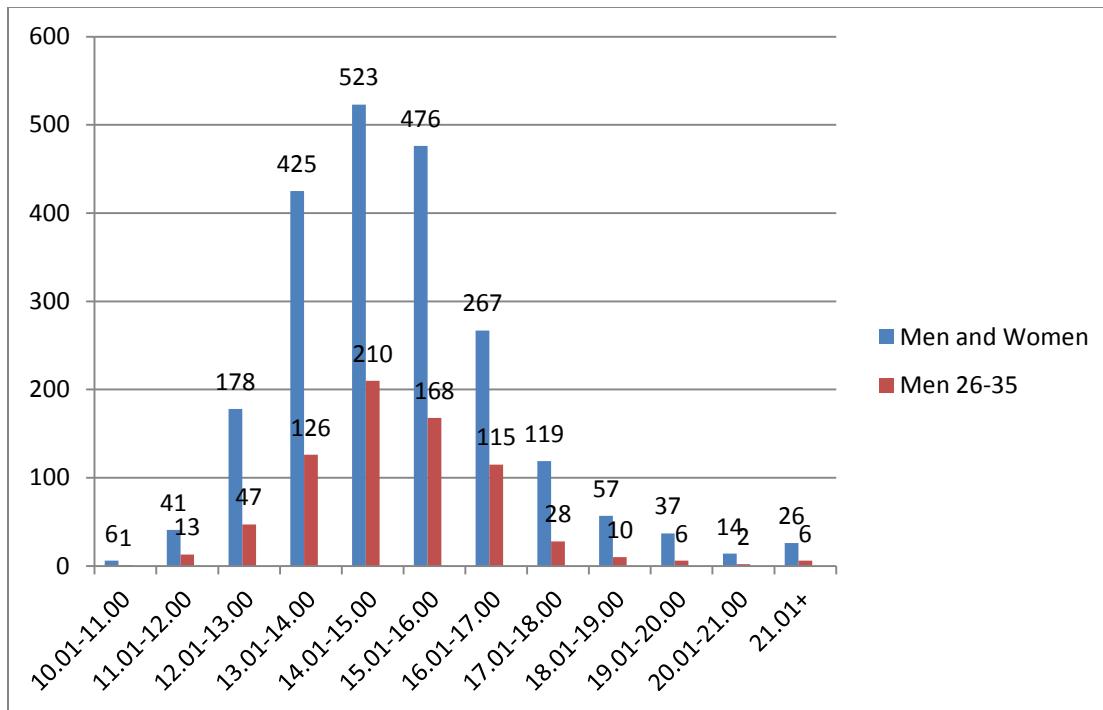


Figure G-5. Two Mile Run Times for Men and Women (n=2169) and Men 26-35 years (n=732)

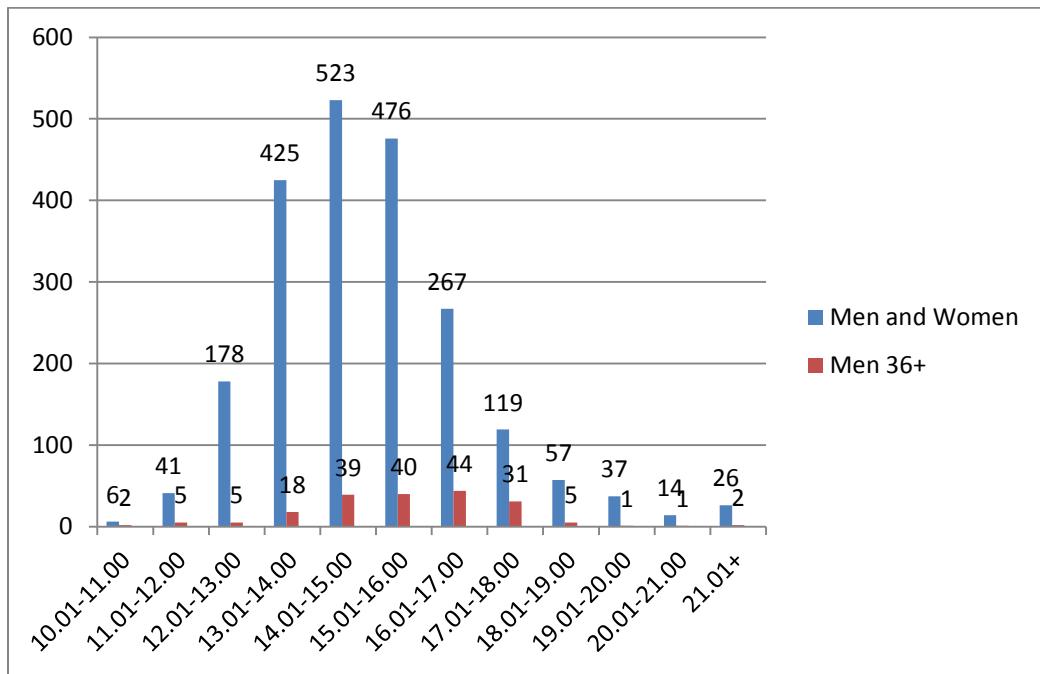


Figure G-6. Two Mile Run Times for Men and Women (n=2169) and Men 36+ years (n=193)

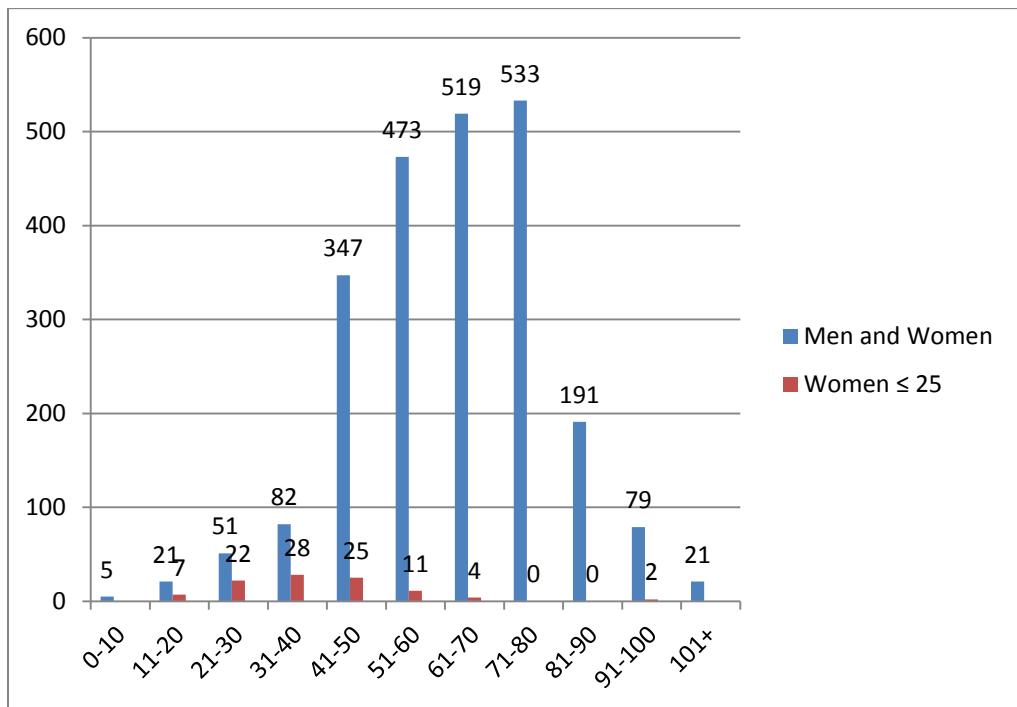


Figure G-7. Push-Ups for Men and Women (n=2322) and Women ≤ 25 years old (n=99)

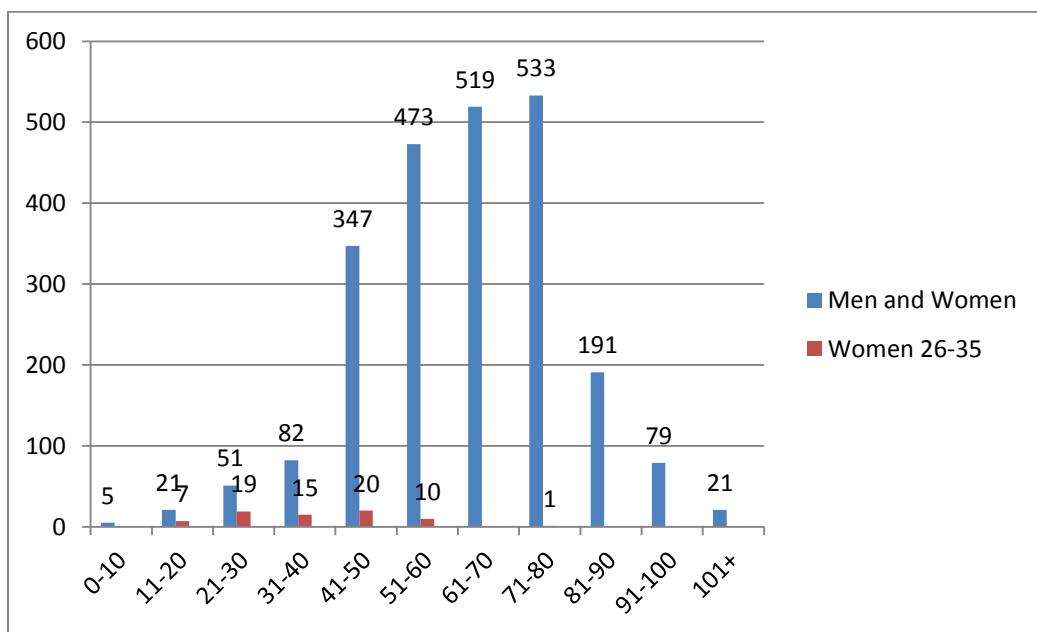


Figure G-8. Push-Ups for Men and Women (n=2322) and Women 26-35 years (n=72)

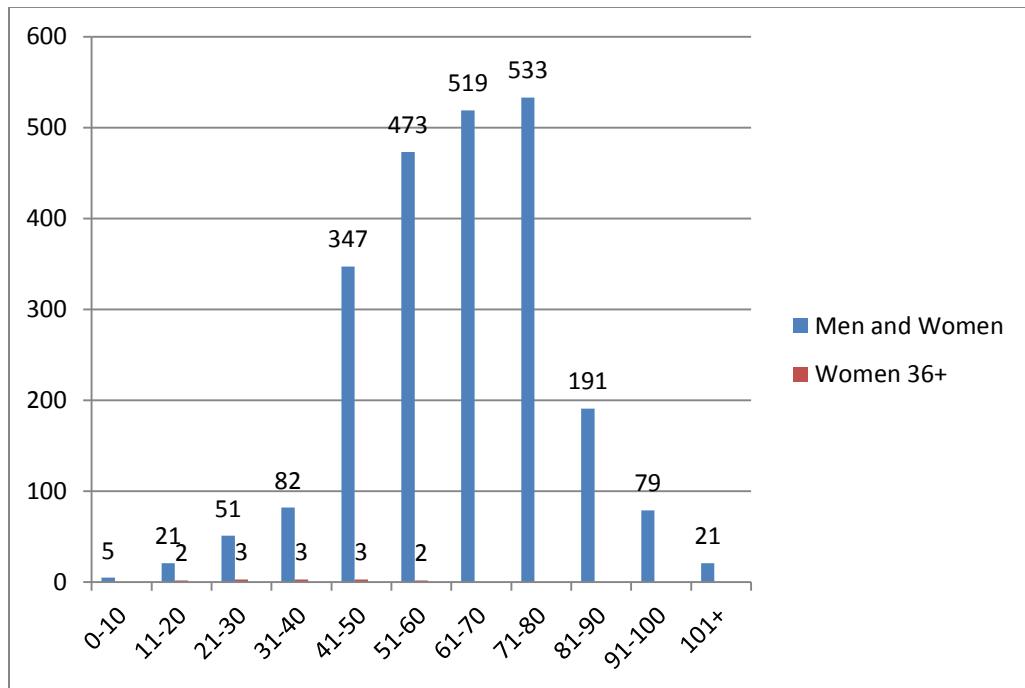


Figure G-9. Push-Ups for Men and Women (n=2322) and Women 36+ years old (n=13)

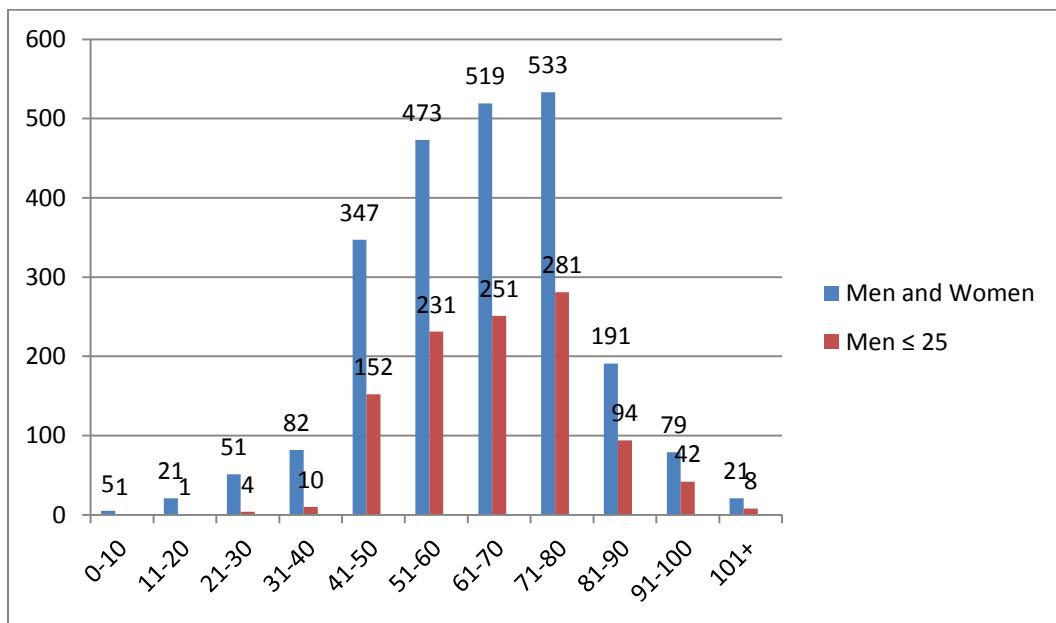


Figure G-10. Push-Ups for Men and Women (n=2322) and Men ≤ 25 years old (n=1075)

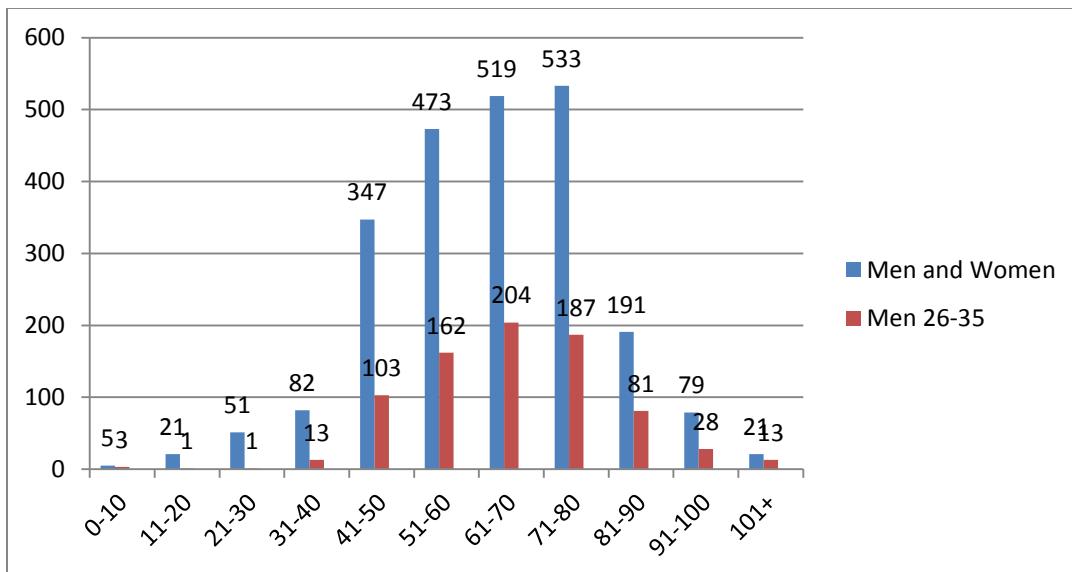


Figure G-11. Push-Ups for Men and Women (n=2322) and Men 26-35 years old (n=796)

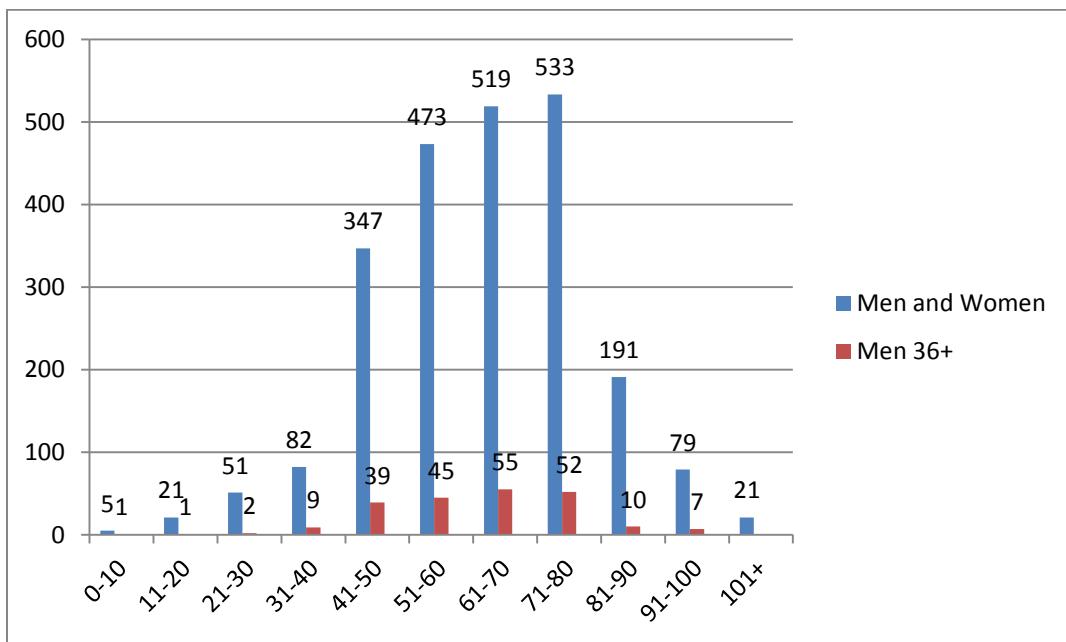


Figure G-12. Push-Ups for Men and Women (n=2322) and Men 36+ years old (n=221)*

Table G-3. Injury Risk and 2 Mile Run Times for Men

Run Time (Minutes and Fraction of a Minute)	n	% Injured	Risk Ratio and 95% CI	p-value
≤ 13.75 min	520	35%	1.00	
13.76-14.67 min	489	36%	1.04 (0.89-1.23)	0.65
14.68-15.75 min	496	41%	1.19 (1.01-1.39)	0.03
15.76+ min	497	44%	1.28 (1.10-1.49)	<0.01

Table G-4. Injury Risk and 2 Mile Run Times for Women

Run Time (Minutes and Fraction of a Minute)	n	% Injured	Risk Ratio and 95% CI	p-value
≤ 16.13 min	42	33%	1.00	
16.14-17.83 min	43	49%	1.47 (0.87-2.48)	0.15
17.84-19.00 min	44	64%	1.91 (1.18-3.09)	<0.01
19.01+ min	42	50%	1.50 (0.89-2.53)	0.12

Table G-5. Injury Risk and Push-Ups for Men

Push-Ups (reps)	n	% Injured	Risk Ratio and 95% CI	p-value
≤ 55	542	49%	1.32 (1.14-1.52)	<0.01
56-66	541	40%	1.10 (0.94-1.28)	0.24
67-76	539	38%	1.02 (0.87-1.19)	0.82
77+	503	37%	1.00	

Table G-6. Injury Risk and Push-Ups for Women

Push-Ups (reps)	n	% Injured	Risk Ratio and 95% CI	p-value
≤ 28	50	58%	1.41 (0.88-2.24)	0.13
29-39	24	55%	1.33 (0.82-2.15)	0.24
40-50	29	46%	1.12 (0.69-1.81)	0.64
51+	14	41%	1.00	

APPENDIX H

**Baseline Soldier Physical Readiness Study Initial Planning Conference
Initial Military Training Center of Excellence; Ft Eustis VA
2-3 October 2012**

USAPHC EXSUM
and
TRADOC Briefing
presented by Mike Haith, TRADOC IMT-CoE

TRADOC SOLDIER PHYSICAL READINESS STUDY PLANNING MEETING

(UNCLASSIFIED)

EXECUTIVE SUMMARY

4 October 2012

(U) SUMMARY OF PHYSICAL READINESS STUDY PLANNING MEETING. (U) (MCHB-IP-DI) On October 2-3, Dr Nindl, CPT DeGroot and Mr Hauret of the Army Institute of Public Health (AIPH) along with CSM Ecker participated in a meeting at Ft Eustis hosted by the TRADOC DCG for IMT. The purpose of the meeting was to develop possible courses of action (COA) for creating a new physical readiness test to replace the current Army Physical Fitness Test. In addition to TRADOC IMT personnel, subject matter experts from USARIEM, West Point and USUHS participated in the planning meeting. Four possible COAs were developed, each of which includes a survey of appropriate stakeholders and a systematic review of the literature; AIPH was identified as the lead for those tasks. In the coming months the COAs will be refined into discreet phases, with subtasks, milestones and phase leads. The TRADOC CG will be briefed in mid-December at which time we expect a COA to be chosen. We anticipate a 2-year timeline until study completion and recommendations for the test. AIPH/APHC personnel will be playing a significant role throughout this important, high-visibility project.

CPT DeGroot/MCHB-IP-DI

APPROVED BY: Dr Bruce Jones

Baseline Soldier Physical Readiness Study Initial Planning Conference

2-3 OCT 12
Initial Military Training Center of Excellence
Ft Eustis VA

Conference Outcome

- Finalize Study Plan Team
- Develop NMT 3 Study Plan Courses Of Action for presentation to CG TRADOC for approval NLT15 DEC 12
- APRT and/or ACRT?
- Develop Literature Review Assignments for Presentation at initial CG TRADOC Decision Brief

Conference Agenda

OCT 2

Registration and Refreshments	0730-0800	Mr. Haith
Welcome and Introductions	0800-0830	Mr. Haith
Study Overview-Mr Haith	0830-0900	Mr. Haith
VTBD overview	0900-0930	Mr. Haith
MG May Welcome Remarks	0930-0945	MG May
Study Plan Proposals	0945-1300	
Historical Review of Army PRT	0945-1015	Dr. East
U BMA	1015-1100	Dr. East
U BARIEM	1100-1145	Dr. Zembraski
IPH	1145-1200	Mr. Haith
CHAMP	1200-1315	Mr. Haith
Working Lunch	1200-1300	Breakout Group Leaders
Study Plan Refinement	1315-1700	Breakout Group Leader
OCT 3		
Study Plan Refinement	0800-1100	Breakout Group Leaders
Literature review assignments-Determining what we know and don't know	1100-1200	Mr. Haith
Conference Wrap Up	1200-1230	Mr. Haith

Attendees

Name	Position	Organization
Mr. Michael E. Haith	HGE	Initial Military Training Center of Excellence
Dr. Whitfield East	Professor/Title 10	United States Military Academy
Dr. Todd Crowder	Associate Professor/Title 10	Department of Physical Education
Mrs. Marilyn A Sharp	Research Exercise Scientist	US Army Research Institute of Environmental Medicine
Dr. Barry Spiering	Research Physiologist	Military Performance Division
Dr Edward Zembraski	Chief, Military Performance Division	
Mr Keith Hauret	Epidemiologist	
Dr Bradley Nindl	Scientific Advisor	Army Public Health Command (PHC)
CPT David DeGroot	Field Invest. Team Leader	
C S M Gerald Ecker	PHC C S M	
Dr. Dianna Purvis	Director, Strategic Operations and Special Programs	Uniformed Services University Consortium for Health and Military Performance (CHAMP)
SGM Jerry Taylor	TRADOC G5 SGM	TRADOC G5
MAJ Nelson Wahab	TRADOC G5 Institutional Training	TRADOC G5

Baseline Soldier Physical Readiness Study

- Purpose
- Study Participants
- Study Concept
- Study Phase Tasks
- Current Status

Baseline Soldier Physical Readiness Study

STUDY PURPOSE	WAY AHEAD
<ul style="list-style-type: none"> Identify baseline soldier physical readiness requirements to perform Warrior Tasks and Battle Drills (WTBD) Develop physical readiness test(s) that evaluates baseline fitness against valid performance standards for all soldiers Test assesses all 3 components of PRT Doctrine: endurance, strength, and mobility Standards of performance for all soldiers, independent of age or gender Standards and Testing aligned with TC 3-22.20, Army Physical Readiness Training (PRT) 	<ul style="list-style-type: none"> Study duration-1 OCT 12 to 30 SEP 14 Study Plan-5 Phases: <ul style="list-style-type: none"> Phase I-Study Plan Development 15 DEC 12 Phase II-WTBD Physical Demands Analysis 14 APR 13 Phase III-Test Development 31 JUL 13 Phase IV-Test Validation 13 DEC 13 Phase V-Establish Test Standards 6 JUN 14 Phases conclude w/ decision brief to CG, TRADOC Study concludes w/ Decision Brief to CSA/SMA NLT 11 JUL 14
STUDY PARTICIPANTS	CURRENT STATUS
<ul style="list-style-type: none"> IMT CoE (Co-lead) USMA (Co-lead) US Army Research Institute of Environmental Medicine (USARIEM) US Army Institute of Public Health (IPH) Uniformed Services University (USU) University of North Texas-Dr. James R. Morrow 	<ul style="list-style-type: none"> Phase 1 Start-Initial Planning Conference 2-3 OCT at Ft Eustis HQDA TASKORD and UFR (\$200K) with TRADOC for final staffing DA G3 Institutional Training (DAMO-TRI) is DA Sponsor All participants agreed to take part in study Study coordinated w/ the TRADOC KSAO Review
DRAFT	

Study Purpose

Employing a team of Army and Civilian SME:

- Identify **baseline soldier physical readiness requirements to perform Warrior Tasks and Battle Drills (WTBD)** that are **criterion based** and focused on **principles of functional fitness** in order to **perform baseline military tasks required of all soldiers in combat**
- Develop **baseline physical readiness assessment tool (test)** for commanders that **accurately evaluates baseline fitness levels against valid performance standards** required for all Soldiers to perform **baseline military tasks (WTBD)**

Study Participants

- IMT CoE-Mr. Michael Haith, Study lead
- Department of Physical Education, USMA-Dr. Chip East, Co-lead
- US Army Research Institute of Environmental Medicine (USARIEM)-Dr. Ed Zambraski, USARIEM Lead
- US Army Institute of Public Health (IPH)-Dr. Bruce Jones, IPH Lead
- Uniformed Services University (USU)- Dr. Patricia Deuster, USU lead
- Comprehensive Soldier Family and Fitness-LTC Dan Johnston, MC
- Academic SME-Dr. James R. Morrow, Regents Professor Kinesiology, Health Promotion & Recreational Studies, University of North Texas

Study Concept

This study will address and/or determine as a minimum:

- The requirement for Fundamental and Functions Fitness tests
- The component physical demands of combat/WTBD
- Field-expedient events that replicate the physical demands on soldiers in combat and baseline soldier skills required to perform WTBDs
- Field-expedient events that accurately predict ability to execute relevant combat tasks in WTBDs
- Are certain events more predictive of WTBD physical performance than others

Revised CG TRADOC Decisions

- COA 1 -Modified APFT (3 events)
 - > 1 min Push-up
 - > 1 min Rower
 - > 2-mile Run
- COA 2-APRT+ (Retain 2-mile Run)
 - > 60-yard Shuttle Run
 - > 1 min Rower
 - > Standing Long Jump
 - > 1 min Push-up
 - > 2-mile Run
- COA 3-2 yr (transition from 3 to 5 events)
 - > 1 min Push-up
 - > 1 min Rower
 - > 2-mile Run
 - > Standing Long Jump
 - > 60-yard Shuttle Run

Physical Fitness Test Taxonomy



Commander's Intent

Success of this study effort is defined as:

- Transparent study responsive to TRADOC CSM direction
- Identification of baseline soldier physical readiness requirements to perform WTBD that are criterion based and incorporate principles of functional fitness
- Development of valid authentic field-expedient assessment tools for commanders that predict Soldier ability to execute WTBD as a *baseline* level of physical preparedness
- A test(s) that assesses all 3 components of Army Physical Readiness- *Endurance (muscular and cardio-respiratory), strength, and mobility*.
- Selection of test events that have high correlation to physical demands of combat and WTBD
- Determination of the threshold of success (standards of performance) for *all Soldiers*, independent of age or gender.
- Standards and Testing aligned with TC 3-22.20, *Army Physical Readiness Training (PRT)*.
- Results that inform KSAO review of fitness requirements for specific branch/MOS/job/unit performance.



Study Plan

IMT CoE will conduct the Baseline Soldier Physical Readiness Study in 5 Phases:

	Suspense
- Phase I-Study Plan Development	15 DEC 12
- Phase II-WTBD Physical Demands Analysis	14 APR 13
- Phase III-Test Development	31 JUL 13
- Phase IV-Test Validation	13 DEC 13
- Phase V-Establish Test Standards	6 JUN 14

• Each Phase concludes w/ decision brief to CG, TRADOC

• Study duration-1 OCT 12 to 30 SEP 14

• Study concludes with Decision Brief to CSA/SMA NLT 11 JUL 14



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Phase I Tasks

Study Plan Development



- Organize research team
- Research Design Planning
- Survey the force for lessons learned after a decade+ of war
- Review of literature
- Review existing policies and procedures
- Analyze trends and indicators of individual (pre & post accession) and unit fitness
- Determine process to analyze physical demands of WTBDs
- Decision brief to CG, TRADOC NLT 15 DEC

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Phase II Tasks

WTBD Physical Demands Analysis

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- Determine and analyze physical requirements of WTBDs
- Report literature review
- Review criterion based assessments
- Review field expedient measures of combat readiness
- Decision brief to CG TRADOC NLT 30 APR 13



Phase III Tasks

Test Development



- Develop criterion based measures of WTBD
- Develop acceptable Test events and test constructs
- Analysis of alternatives
- Determine limitations on recommended test battery – events, levels
- Decision Brief to CG TRADOC NLT 31 JUL 13

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Phase IV Tasks

Test Validation

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- Collect empirical data for criterion and field expedient test events
- Collect performance data
- Utilize the qualitative and quantitative empirical data to develop battery of field expedient measures to best predict criterion measure
- Decision Brief to CG TRADOC NLT 13 DEC 13

Phase V Tasks

Establish Test Standards

- Collect referent data for various demographic populations in order to establish performance scales
- Collect data for the final test events in order to establish preliminary scoring scales and standards.
- Decision Brief to CG TRADOC NLT 6 JUN 14.
- Decision Brief to CSA and SMA for approval of Physical Readiness test with Standards NLT 11 JUL 14.

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Current Status

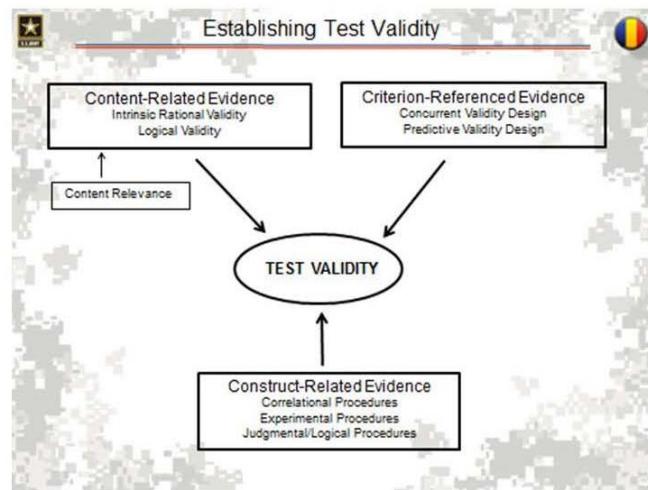
- Established by invitation milSuite site to share documents and status
<https://www.milsuite.mil/book/groups/soldierbaselinephysicalreadiness>
- Phase 1 start 1-4 OCT 12 Ft Eustis-Bldg 210 IMT CoE
- HQDA TASKORD and UFR with TRADOC Staff for final staffing **S: 28 SEP 12**
- DA G3 Institutional Training (DAMO-TRI) is DA Sponsor
- All participants have agreed to participate
- Coordinated Study TASKORD with TRADOC LNO to FORSCOM (Colonel)
- Coordinating study with the TRADOC KSAO Review

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USMA-Testing Outcomes

- To provide an accurate representation of performance

1. Validity – the appropriateness, meaningfulness, and usefulness of specific inferences made from test scores
2. Reliability – consistency of outcomes over time (intra-rater reliability)
3. Objectivity – consistency of outcomes over raters (inter-rater reliability)



Developing a Functional Fitness Test

1. Identify the physiological aspects of WTBD
2. Review input for the field
3. Collect empirical data as needed
4. Formulate assessment(s)
5. Validate against a known criterion

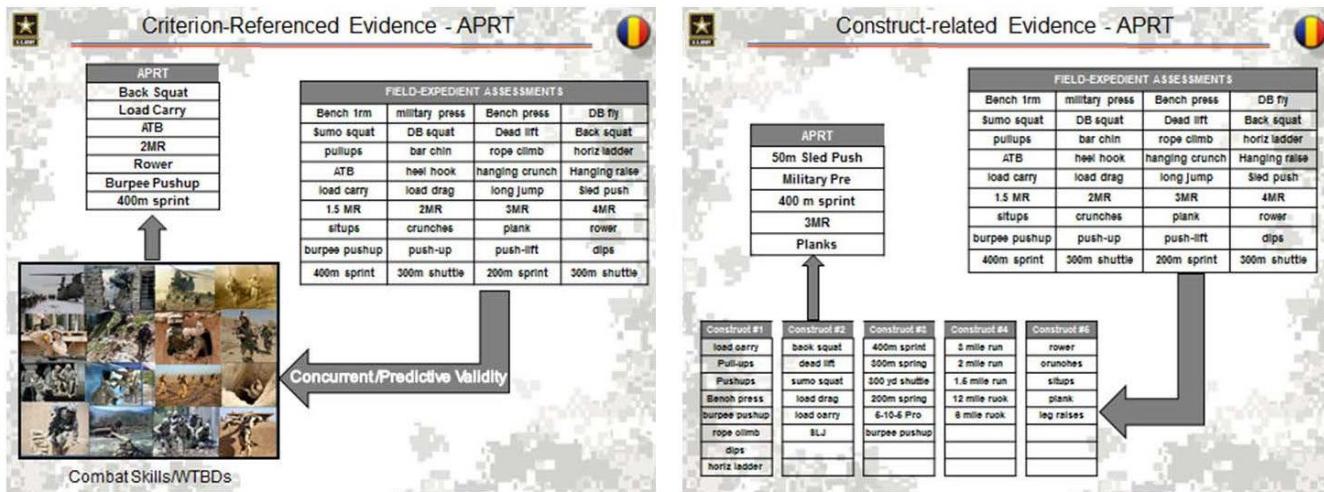
Content-Related Evidence - APRT

APRT		FIELD-EXPEDIENT ASSESSMENTS	
Bench Press		Bench rm	military press
Sumo Squat		Sumo squat	DB squat
Pull-ups		pullups	bar chin
1.5 MR		ATB	dead lift
Rower		load carry	rope climb
Burpee Pushup		burpee pushup	horiz ladder
400m sprint		400m sprint	heel hook

↑

BOGSAT

←



Consortium for Health and Military Performance (CHAMP)

Course of Action for APRT Study
1 October 2012

Dianna Purvis, PhD(c), PMP
Director, Strategic Operations and Special Programs

APRT Study Tasks

PHASE 1: Analysis

- Identify mission essential tasks (MET) associated with Warrior Tasks and Battle Drills (WTBD) required for all Soldiers
- Identify functional movements associated with METs
 - Squat, deadlift, overhead press, trunk rotation, etc.
- Identify energy system contribution to METs
 - Aerobic vs. anaerobic
 - Identify time to perform MET - Short burst, medium effort, or long and sustained activity
- Identify movement qualities associated with MET
 - Mobility
 - Balance/stability
 - Agility
 - Accuracy

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APRT Study Tasks (cont.)

PHASE 2: Development

- Develop baseline soldier physical readiness requirements to perform WTBD
 - Based on analysis phase results
 - Incorporate relevant Soldier survey data
 - Information from Soldiers based on their perceived needs to be physically ready for MET
 - Highlights strengths and weaknesses of current PRT and conditioning methods from Soldier's perspective
- Develop physical readiness test (PRT) that assesses required components of WTBD
 - Include endurance, strength, and mobility and any other essential elements as defined by analysis phase

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APRT Study Tasks (cont.)

PHASE 3: Testing

- Pilot test PRT
- Refine PRT test based on pilot data
- Validate PRT test
- Establish age and gender norms

PHASE 4: Surveillance

- Construct data capture system/use existing systems to assess new PRT standards effect on reduction of musculoskeletal injuries and improved physical readiness
 - Is it working to improve physical readiness and reduce injuries?

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Literature Review Assignments

- Physical Training Test History Overview-USMA
- Female Physical Development and Injuries-IPH
- Injuries and Injury Prevention-IPH
- Selecting physical Performance Standards-USARIEM
- Foreign Army Physical Testing and Test Development-USARIEM
- Army Physical Development and Testing (RAW, ETAP, etc)-IPH
- Sister Service Testing and Test Development-IMT-Mr Haith

COA Development

- Physical Training Test History Overview-USMA
- Female Physical Development and Injuries-IPH
- Injuries and Injury Prevention-IPH
- Selecting physical Performance Standards-USARIEM
- Foreign Army Physical Testing and Test Development-USARIEM
- Army Physical Development and Testing (RAW, ETAP, etc)-IPH
- Sister Service Testing and Test Development-IPH

COA #1

1. Conduct systematic review
2. Conduct focus groups and surveys with Army Leaders
3. Based on the systematic review and focus group results, develop/identify all field-expedient foundation fitness tests to meet physical requirements WTBDs
 - Narrow field-expedient test options
4. Obtain stakeholder and external SME consensus of the foundation fitness test(s)
5. Submit fitness test battery to CG, TRADOC for approval.
6. Conduct field study to determine the criterion-referenced standard (2 months)
7. Submit recommended physical fitness test battery and standards.

COA #2

1. Conduct systematic review (6 months)
2. Conduct focus groups and surveys with Army Leaders (3 months; concurrent with #1)
 - Identify WTBD descriptions and field-expedient tests
3. Based on the systematic review and focus group results, develop/identify all field-expedient foundation fitness tests to meet physical requirements WTBDs (1 month)
 - Narrow field-expedient test options
4. Conduct field study to collect performance data to establish the construct validity of the foundation fitness events (6 months)
5. Obtain stakeholder and external SME consensus of the foundation fitness test(s) (1month)
6. Submit fitness test battery to CG, TRADOC for approval
7. Conduct field study to determine the criterion-referenced standard (2 months)
8. Submit recommended physical fitness test battery and standards.

COA #3

1. Systematic review (6 months)
2. Panel/SME meeting (based on results of systematic review) to leverage /refine currently existing scientific protocol (1 month)
 - Define WTBD tests
 - Identify reasonable field-expedient tests (APRT tests)
3. Data collection (6 months)
 - WTBD performance
 - Field-expedient test performance
 - Leader assessment of soldier performance
4. Data analysis (2 months)
 - Establish minimally acceptable WTBD performance
 - Identify most predictive field-expedient tests
5. Submit fitness test battery to CG, TRADOC for approval
6. Conduct field study to determine the criterion-referenced standard (2 months)
7. Submit recommended physical fitness test battery and standards.

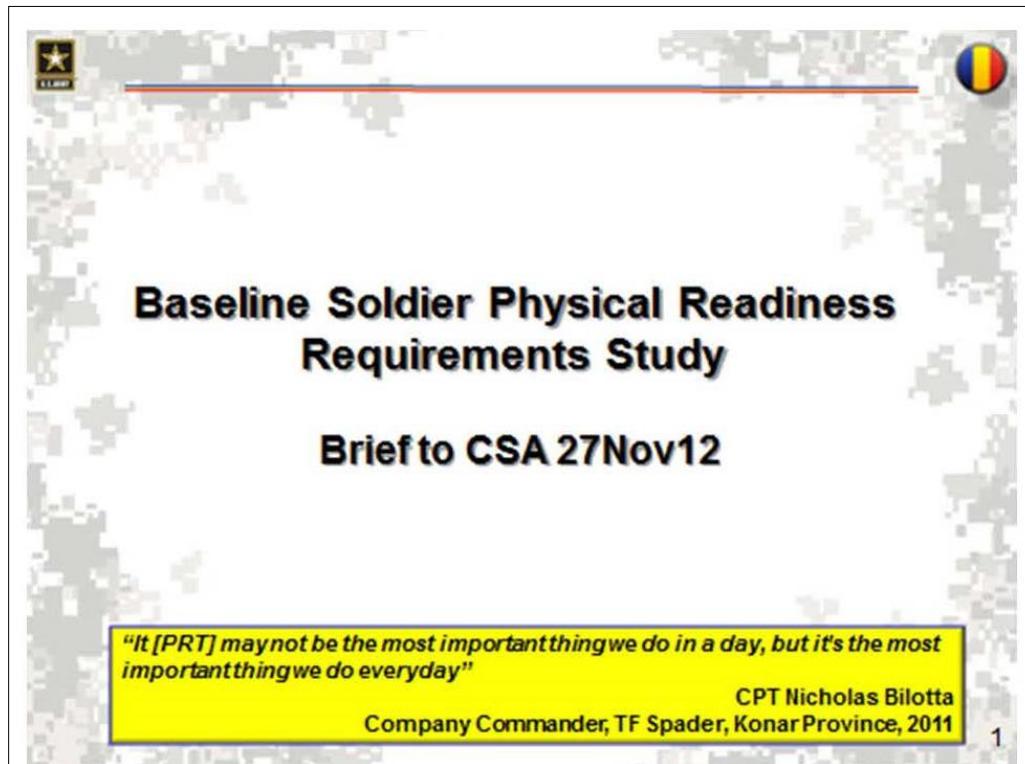
COA #4

1. Systematic review (8 months)
2. Thorough task analysis (8-9 months; concurrent with Step #1)
 1. Survey workforce
 2. Focus groups
 3. WTBD / common soldiering task analysis (instrumented field data collection)
3. Test development (3 months)
 1. WTBD simulations
 2. Field-expedient tests
 3. SME/Army approval
4. Data collection (5 months)
 - WTBD performance
 - Field-expedient test performance
 - Leader assessment of soldier performance
5. Data analysis (2 months)
 - Establish minimally acceptable WTBD performance
 - Identify most predictive field-expedient tests
6. Submit fitness test battery to CG, TRADOC for approval
7. Conduct field study to determine the criterion-referenced standard (2 months)
8. Submit recommended physical fitness test battery and standards.

APPENDIX I

**TRADOC Initial Baseline Soldier Physical Readiness Requirements Study Concept
Brief
for the Army Chief of Staff (CSA)
27 November 2012**

Presented by Mike Haith, TRADOC IMT-CoE



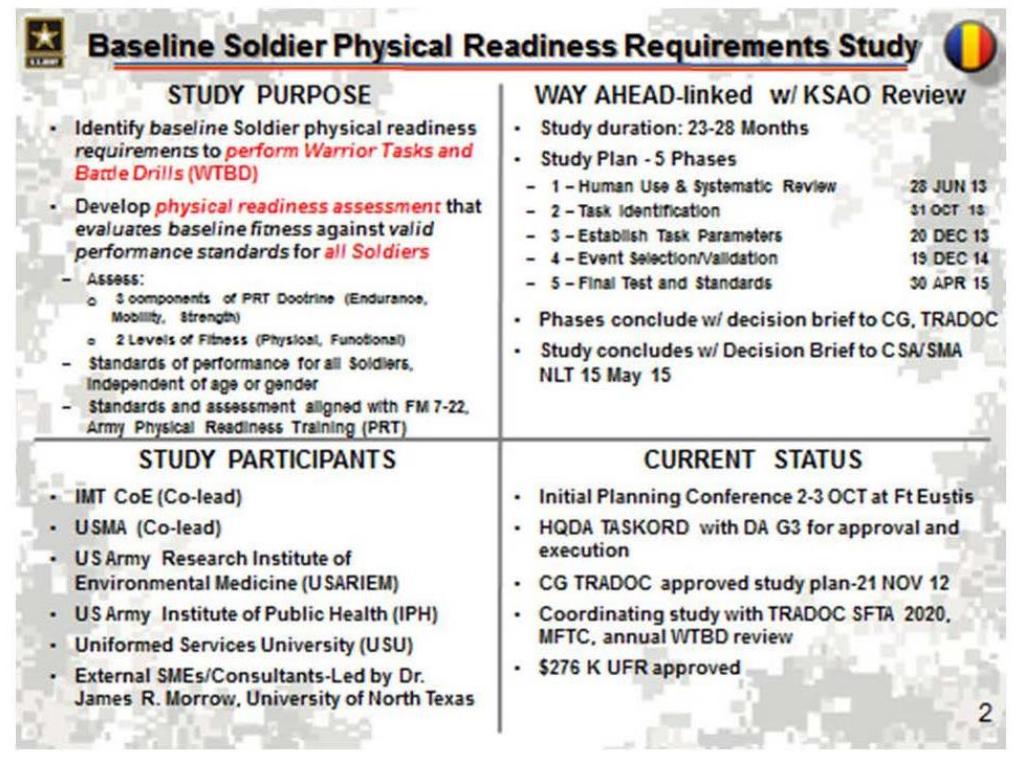
Baseline Soldier Physical Readiness Requirements Study

Brief to CSA 27Nov12

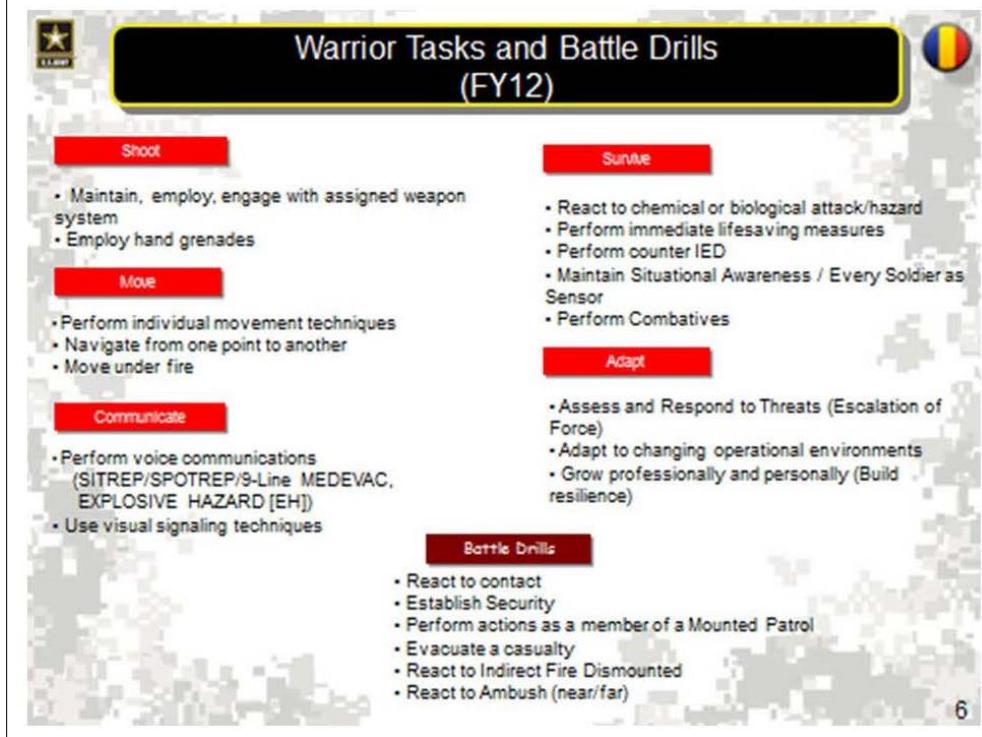
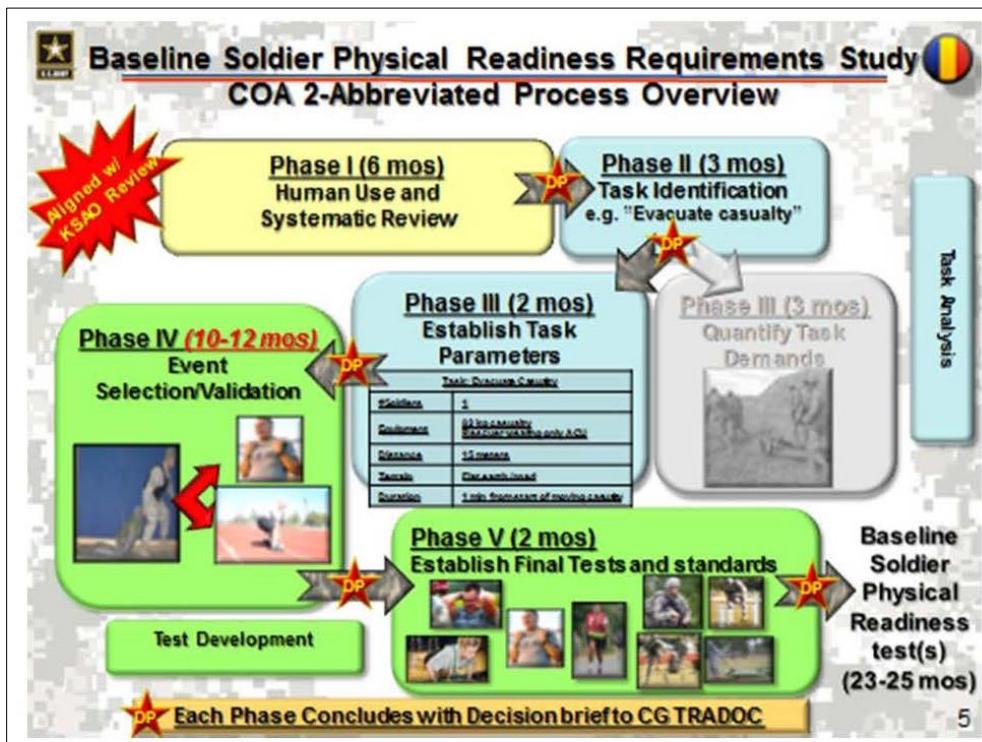
"It [PRT] may not be the most important thing we do in a day, but it's the most important thing we do everyday"

CPT Nicholas Bilotta
Company Commander, TF Spader, Konar Province, 2011

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Baseline Soldier Physical Readiness Requirements Study	
STUDY PURPOSE <ul style="list-style-type: none">Identify baseline Soldier physical readiness requirements to perform Warrior Tasks and Battle Drills (WTBD)Develop physical readiness assessment that evaluates baseline fitness against valid performance standards for all SoldiersAssess:<ul style="list-style-type: none">3 components of PRT Doctrine (Endurance, Mobility, Strength)2 Levels of Fitness (Physical, Functional)Standards of performance for all Soldiers, independent of age or genderStandards and assessment aligned with FM 7-22, Army Physical Readiness Training (PRT)	WAY AHEAD-linked w/ KSAO Review <ul style="list-style-type: none">Study duration: 23-28 MonthsStudy Plan - 5 Phases<ul style="list-style-type: none">1 - Human Use & Systematic Review 28 JUN 132 - Task Identification 31 OCT 133 - Establish Task Parameters 20 DEC 134 - Event Selection/Validation 19 DEC 145 - Final Test and Standards 30 APR 15Phases conclude w/ decision brief to CG, TRADOCStudy concludes w/ Decision Brief to CSA/SMA NLT 15 May 15
STUDY PARTICIPANTS <ul style="list-style-type: none">IMT CoE (Co-lead)USMA (Co-lead)US Army Research Institute of Environmental Medicine (USARIEM)US Army Institute of Public Health (IPH)Uniformed Services University (USU)External SMEs/Consultants-Led by Dr. James R. Morrow, University of North Texas	CURRENT STATUS <ul style="list-style-type: none">Initial Planning Conference 2-3 OCT at Ft EustisHQDA TASKORD with DA G3 for approval and executionCG TRADOC approved study plan-21 NOV 12Coordinating study with TRADOC SFTA 2020, MFTC, annual WTBD review\$276 K UFR approved



APPENDIX J

**USAPHC Preliminary Review –
Military-Relevant Tasks Identified for Systematic Review**

Table J-1. Summary of Preliminary Assessment of Military (Army) - Relevant Tasks

MILITARY	Manual tasks Lift, Carry, Push, Pull	Upright Moving Marching, Walking, Running	Other Key Activities	Sources and Notes
CANADA (2009)	<ul style="list-style-type: none"> Lift (e.g., Ammunition box) Carry (e.g. Sand bag) Lift & carry (Jerry can) 	<p>Marching -Weight-loaded (~13 km) 3 loads: Fighting/Approach/Emergency</p>	<ul style="list-style-type: none"> Digging (Entrenchment dig) 	NATO 2009 - key source Singh et al, 1991
CANADA (2008-2010)	<p><i>Same as above, plus:</i></p> <ul style="list-style-type: none"> Vehicle extrication (VE) Casualty Drag (CD) (150-180 lb mannequin 20-25 m) <p>Per observations, drag new method and about one third of 126 observed CE involved VE.</p>	<p>Re-Evaluation of marching: still appears a very relevant task even for non-Combat based on surveys. Almost half of respondents indicated often or more though distance < 13 k and loads heavier</p>	<p>Re-evaluation of digging: appears somewhat relevant task though not definitive data</p>	Reilly 2010 -Canadian 'standards' test for job selection and readiness is separate from physical fitness test (push up, sit up, run) 2010 – Canadian Land Force PT Assessment – evaluation of (7) Predictive Fitness Tests: pushups, grip strength, grip endurance, static squat, static row, wall sit, vertical jump. Evaluation of CD/VE = grip strength and static squat most predictive
UNITED KINGDOM (2009)	<ul style="list-style-type: none"> Lifting (88%) <ul style="list-style-type: none"> ~70% from ground; 57% to waist, 28% to shoulder, 15% to overhead; test via Ammunition box lift of 1.7 m Carry (48%) <ul style="list-style-type: none"> Test with: sand bag, drum, extinguisher Push -pull (3%) 	<ul style="list-style-type: none"> March (Road) (2 %) 	<ul style="list-style-type: none"> Digging (Trench Dig) (1%) Climbing (3%) Crawling (2%) 	NATO 2009 key sources: Bilzon 2002 Rayson, 1998 : % are based on 1998 task review
NETHERLANDS	<ul style="list-style-type: none"> Lifting and carrying 	<ul style="list-style-type: none"> Walking (Loaded) 		NATO 2009
UNITED STATES (2009)	<ul style="list-style-type: none"> Lifting/lowering (41%) Carry/load bear (30%) Pull/torque (6%) Push 	<ul style="list-style-type: none"> Walking/Running/Marching Infantry -Marching for a long distance, load bearing) 	<ul style="list-style-type: none"> Climb/descend (4%) Reach 2% Stoop 2 % (Dig/Crawl/Throw etc -<1%) 	NATO 2009 - % are based on Sharp et al, 1998 a review of 1,999 MOS task requirements (does not address actual measured continuum of activity levels) Also Knapik 2004 (TR)
UNITED STATES (2011, and 2013 Warrior Tasks and Battle tasks (WTBD) Analysis)	<p><i>Above items but more specifically:</i></p> <ul style="list-style-type: none"> 'Casualty evacuation' [top ranked Battle Drill, 'life saving measures ' top warrior task) Lift and carry specific weights listed for each MOS (see Notes) based on tasks involving equipment, supplies, ammunition) Repetitive lifting 	<ul style="list-style-type: none"> Weight-loaded march (move location, security patrol) Key WTBD: 'Move under fire' & and 'React to ambush.' Includes following: <ul style="list-style-type: none"> → Weight-loaded run → Run (no load) – (endurance, and sprint) → Stop/start/change direction → Crawl (High & low) 	<p>Key Common Warrior Tasks (CWT)</p> <ul style="list-style-type: none"> Crawling (low/high) Traverse pipes Jump hurdles Climb walls Stairs (up/down) Rushes and sprints Obstacle/slalom course Block/strike Employ/engage weapon Throw grenade <p>Key physical actions for most CWT</p> <ul style="list-style-type: none"> Squat, Lunge, Jump 	<ul style="list-style-type: none"> 2011 STP 21-1-SMCT: CWT due to increased number of operations in urban settings. March 2013 WTBD Analysis: Survey response, n = 28, 024) <ol style="list-style-type: none"> Jump or leap over obstacles Move with agility and coordination Carry heavy loads Drag heavy loads Run long distances (tie) Sprint (tie)

Table J-1. Summary of Preliminary Assessment of Military (Army) - Relevant Tasks (continued)

AUSTRALIA	<ul style="list-style-type: none"> ▪ Lift [“Strength”] (via Box lift and place (55 & 66 lbs) ▪ Carry [“Local muscle endurance”] (via Jerry can carry: 136 & 300 yds) 	<ul style="list-style-type: none"> ▪ March (Loaded) [“Aerobic”] (via 5 km w 22kg); & 10 km w 38 kg) ▪ Fire and movement simulation [“Anaerobic”] (via 16 x 6m bounds + leopard crawl) 	<ul style="list-style-type: none"> ▪ 	2012-Australian Defense Science and Technology Organization: Proposed Employment Standards (PES): (1) All Corps Soldier(ASC) and (2) Combat Arms (CA). No age/gender bias; more rigorous tests for required for certain occupations
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NOTES

- a) One of US Army Common Warrior Task includes donning and basic movement in military gas mask – this is not addressed in this PT assessment
- b) Weight estimates: Jerry can weight: 10.5lb empty; ~41lb full (Rayson: ~ 20kg); Ammo box weight: 5lb empty; ~90 full ; (Rayson :35 kg up to 75 kg) ; Sandbags –weights vary (e.g., 40, 60, -- 150)
- c) Loads for marches – military loads vary from 5 to 68 kg over distances 5-20 k (NATO 2009)
- d) Current MOS Physical Demand weights (Army , 2007) : Light(LT) = 10-20 lbs, Moderate (MD= 25-50), Moderately heavy(MH)= 40-80, Heavy (HV)= 50-100; and very heavy(VH)=>50->100

Cited Information Sources

- [NATO 2009: North Atlantic Treaty Organization \(NATO\)- Research and Technology Org \(RTO\) Human Factors and Medicine Panel \(HFM\) Technical Report \(AC/323\(TR-HFM-080\)TP/200; Optimizing Operational Physical Fitness. 2009](#)
- [Singh et al, 1991: Singh, M., Lee, Wheeler et al. Related Physical Fitness and Performance Standards for the Canadian Army. University Of Alberta. 1991.](#)
- [Reilly 2010: Reilly, T. Canada's Physical Fitness Standard for the Land Force: A Global Comparison; published in \[www.armyforces.gc.ca/caj\]\(http://www.armyforces.gc.ca/caj\)2010; obtained 2012](#)
- [2010 – Canadian Land Force PT Assessment : Personal communications with Canadian SMEs, recorded by Mr. Michael S. McGurk Director, Research & Analysis Directorate; Initial Military Training Center of Excellence \(IMT-COE\), ATTN: ATCG-MTA, 210 Dillon Circle, Fort Eustis, VA](#)
- [2011 STP 21-1-SMCT: Headquarters Department of the Army, Soldier's Manual of Common Tasks Warrior Skills Level 1, May 2011.](#)
- [March 2013 WTBD Analysis: Discussion brief by W. East \(West Point\) for IMT-COE, March 2013.](#)
- [2012-Australian Defense Science and Technology Organization: Proposed Employment Standards:](#)
- [Bilzon, 2002: Bilzon J. L. J., Scarpello E.G., E. Bilzon and A. J. Allsopp; Generic task-related occupational requirements for Royal Naval personnel. *Occup. Med.* Vol. 52 No. 8, pp. 503–510, 2002.](#)
- [Rayson, 1998: The development of Physical Selection Procedures \(Phase 1 Job Analysis\). 1998.](#)
- [Sharp et al, 1998: M.A. Sharp, J.F. Patton and J.A. Vogel. U.S. Army Research Institute of Environmental Medicine 9USARIEM\) Technical Report T98; A Database of Physically Demanding Tasks Performed by US Army Soldiers. Natick, MA 01760-5007](#)
- [Knapik, 2004. The Case for Pre-Enlistment Physical Fitness Testing: Research and Recommendations. USACHPPM Report No. 12-HF-01Q9D-04, 2004.](#)

Table J-2. Examples of Military–Relevant Civilian Occupational Physical Performance Tests

Occupation	Manual tasks	Upright and Moving	Other Tasks	Sources and Notes
US Department of Labor industry standards-	<ul style="list-style-type: none"> ▪ Lift and carry (specific weight groups described) 	<ul style="list-style-type: none"> ▪ Standing 	<ul style="list-style-type: none"> ▪ Sitting 	Harbin 2005
Firefighters*	<ul style="list-style-type: none"> ▪ Fire hose carry (upstairs) ▪ Ladder lift/ladder extension ▪ Victim drag or carry or drag downstairs 	<ul style="list-style-type: none"> ▪ Continuous walking through all drills ▪ Walk/Run with 'load' (equipment, protective clothing) 	<ul style="list-style-type: none"> ▪ Stair climbing ▪ Ladder climbing ▪ Forcible entry ▪ Sledge hammer drive ▪ Rake 	Rhea, 2004 ; Davis, 1982 . Tests are sometimes – though not always) performed in fire fighter clothing – including SCBA.

[Harbin 2005](#). Harbin, G and Olson, J. Post-Offer, Pre-Placement Testing in Industry; *American Journal of Industrial Medicine* 47:296–307; 2005.

[Rhea, 2004](#). Rhea, MR, Alvar BA, Gray, R. Physical Fitness and Job Performance of Firefighters. *Journal of Strength and Conditioning Research*, 18(2), 348–352; National Strength & Conditioning Association; 2004.

[Davis, 1982](#). Davis, PO et al. Relationship between simulated fire-fighting tasks and physical performance measures; *Medicine and Science in Sports and Exercise* Vol. 14, No. 1, pp. 65-71 1982.

Table J-3. Example Military Tasks As Associated with Components of Fitness

Physical Requirement Areas ^{1,2}		Fitness Components ³	Primary Physical Fitness Sub-Components and Definitions ³	Example Associated Military Tasks/Activities ³
AEROBIC	ENDURANCE	CARDIO-RESPIRATORY ENDURANCE	➔ Stamina “Aerobic fitness”	Ability to sustain high repetition low intensity muscle contractions for long duration
		MUSCULAR ENDURANCE ⁴	➔ Dynamic Strength “Anaerobic”	Ability to conduct high intensity muscle contractions repeatedly for relatively short periods of time
ANAEROBIC	STRENGTH	MUSCULAR STRENGTH	➔ Static Strength	Ability to exert maximal force against a fairly immovable object for a short time
			➔ Explosive Power “Anaerobic”	Ability to expend a maximum of energy to rapidly project or move an object or the body in one burst or a series of bursts
	MOBILITY (and AGILITY)	FLEXIBILITY	➔ Extent & Dynamic	Ability to stretch, flex or otherwise lengthen various body parts (Dynamic = quickly) as far as possible
		COORDINATION	➔ Gross body coordination	Ability to synchronize simultaneous movement of a number of body parts.
	BALANCE	➔ Static & Dynamic	Ability to maintain body at equilibrium (stable posture) in a fixed position (when static and when moving)	<ul style="list-style-type: none"> ♦ Stop/change direction (e.g., while running cover to cover) with and without load ♦ March/run/walk/carry ; with and without load ♦ Shoot

¹ Does not address Body Composition² Aerobic capacity, strength, endurance (DODI 1308.1) ; anaerobic capacity and mobility and subcomponents such as power/speed, agility, coordination, balance (AR 350-1,611-1; DA Pam611³ Key components and definitions reference: (Knapik , 2004) “The Case for Pre-Enlistment Physical Fitness Testing: Research and Recommendations.” Technical Report 12-HF-01Q9D-04. USACHPPM 2004.⁴ Key sources describing common tasks include: Knapik , 2004; NATO, 2009; Sharp, 2009; MSCoE, 2011; Haith, 2013 (Personal communications re: 2012 KSO)

APPENDIX K

**Physical Readiness Requirements Study
USAPHC IPP Soldier Systematic Review- Final 2013 Update Brief to TRADOC
Interim Findings ***
12 July 2013

* As noted in the methods and results section of this document, this presentation represents the findings of the abbreviated system review process in July 2013. This information was considered adequate for the needs of TRADOC, but does not represent a formal or complete Systematic Review. Complete of systematic review is an intended objective of the IPP participants. The systematic review s would provide more quantitative information regarding correlations and limits it data confidence. The general findings identified in this July briefing, however, indicated there are gaps in specific research regarding the physical demands of Army WTBD. This supported TRADOC's decision to conduct field studies to specifically evaluate current Army WTBDs.

U.S. Army Public Health Command
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**Systematic Review: Baseline Soldier
Physical Readiness Requirements Study**

**Update
12 July 2013**

Injury Prevention Program
US Army Public Health Command
and
Consortium of Health and Human Performance
Uniformed Services University of Health Sciences

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Subject Areas for the Systematic Review

Subject Areas	
1	Lab vs Field Tests to Assess Physical Fitness <i>Tyson Grier, Morgan Anderson, Tim Bushman (USAPHC)</i>
2	Comparison of Physical Fitness Tests to Job Task Performance <i>CPT(P) DeGroot and Veronique Hauschild (USAPHC)</i>
3	Association of Task Performance and Injury <i>Keith Hauret and Elizabeth Clearfield (USAPHC)</i>
4	Association of Components of Physical Fitness and Injury <i>Dr. Dianna Purvis, Dr. Pete Lismann, Dr. Sarah Delamotte, and Ms. Kaitlin Murphy (USUHS)</i>

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Overall Scope of Work for the Literature Review (Four Subject Areas)

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graph TD; A[Records identified through systematic database search and SMT query (n = 57,484)] --> B[Total records after duplicates removed; Titles and abstracts were screened to determine relevancy (n = 49,316)]; B --> C[Full-text articles obtained and reviewed to assess eligibility (n = 901)]; C --> D[Final number of studies included in qualitative synthesis of data (n = 383)]; C --> E[Records excluded based on population and military relevancy (n = 48,415)]; C --> F[Full-text articles excluded based on military relevancy and type of data available (n = 518)];
```

Inclusion

Exclusion

Eligibility

Screening

Identification

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Subject Area 1: Lab vs. Field Tests to Assess Physical Fitness

- Aerobic Tests - Gold Standard: Measured VO₂ max performed on a treadmill
 - Timed runs and multistage stage shuttle runs
 - Showed excellent reproducibility and good to excellent validity when correlated with VO₂ max.
- Anaerobic Tests - Gold Standard: Wingate Test
 - Sprints and shuttle runs
 - Showed excellent reproducibility and fair to good validity when correlated with VO₂ max.
- Muscular Strength and Endurance Tests - Gold Standard for Muscular Strength is 1 repetition maximum. No Gold Standard for Muscular Endurance
 - One repetition maximum, horizontal jump, dips, hand grip strength, pull-ups and flexed arm hang, squats, push-ups, and rope climb
 - Showed excellent reproducibility.
 - Maximum repetitions and sit-ups
 - Had fair to good reproducibility.
- Functional Tests - No Gold Standard
 - Agility and hop tests
 - Showed excellent reproducibility
 - Obstacle course
 - No reproducibility measurements performed.
 - Performance was found to have fair to good validity when correlated with VO₂ max.
 - Equipment needed and more difficult to administer

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Subject Area 2: Comparison of Physical Fitness Tests to Job Task Performance

- Performance on several groups of military 'activities' have been compared to different fitness tests
 - Task activities: Casualty Drag, Loaded March, Lift/Lower/Carry, Push/Pull, Sprint, Climb, Crawl, Dig, combined events /multiple-activities (e.g., obstacle courses)
 - Fitness tests: Aerobic (runs), Anaerobic (sprints, shuttles), Strength and Endurance (Push up, sit up, pull up, jumps, squats, bench press, other machines)
- Activities are common elements of military task performance, but do not individually reflect the complex series of physical activities required to perform Warrior Tasks/Battle Drills – *EXCEPT*:
 - Casualty drag
 - Loaded march
- Key physical requirements include:
 - Casualty drag – Anaerobic (400m sprint test) was best predictor
 - Road march with a load - Aerobic fitness was best predictor BUT data from only 1 study

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Subject Area 3: Association of Performance Tasks and Injury

- Loaded road march is the only military performance task that has been studied to identify the association of injuries with task performance (9 studies)
 - Injuries increase with greater distance or heavier load
- Physically Demanding MOSS
 - Compared to Soldiers in "light" physical demand MOSSs, Soldiers in "moderate" and "heavy" physical demand MOSSs are 16% and 76%, respectively, more likely to be hospitalized for an on-duty injury
- When developing training programs, the following factors from civilian occupational studies should be considered:
 - Lifting: Injuries increase when lifting is performed with 1) greater frequency, 2) more weight, or 3) weight is lifted to higher levels (eg waist vs head height)
 - Pushing/Pulling: Shoulder injuries are commonly observed; increased injury risk is based on frequency of the activity and amount of force applied
 - Kneeling/Squatting: Workers in jobs that require kneeling or squatting have more injuries, overall, and more knee injuries than workers who don't do these activities

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Subject Area 4: Association of Physical Fitness and Injury

- Cardiovascular Endurance:
 - Most frequently studied fitness component
 - Poor run time is consistently and strongly associated with musculoskeletal injury (MSK-I; in > 80% articles reviewed)
- Muscular Endurance
 - Low muscular endurance (assessed via push-ups or sit-ups) is moderately associated with MSK-I
- Muscular Strength
 - Little data exists for females and has not been heavily studied in men
 - Association with MSK-I is unclear due to inconsistent findings
- Flexibility
 - Extremes (high or low) in flexibility are associated with MSK-I as measured by sit and reach test
- Balance, agility, speed, coordination, and power
 - Little or no data found for each of these fitness components

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Summary and Conclusions

- Reflecting the current APFT, there is a considerable body of injury and performance literature concerning muscular endurance and cardiovascular fitness
 - Research and injury surveillance will be increasing important when a new fitness test is fielded
- With the exception of casualty drag and road marches, there is a lack of research concerning the physical demands of Warrior Tasks and Battle Drills
 - Data collection planned in support of the Baseline Soldier Physical Readiness study will address this need
- There continues to be a need to strike a balance between training to improve physical performance and avoiding over-training so as not to cause injury
 - More ≠ Better



Backup Slides

Subject Area 1:

Lab vs. Field Tests to Assess Physical Fitness

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Tests to Assess Components of Physical Fitness								
Measures of Fitness	Test	Reliability-Mean	Reliability-Median	Reliability-Range	Validity-Mean	Validity-Median	Validity-Range	% of Articles Reviewed
Aerobic Tests	Timed Runs	0.90	0.90	0.90	0.71	0.72	0.54-0.94	10
	Multistage shuttle runs	0.82	0.87	0.76-0.99	0.80	0.89	0.63-0.99	21
	Distance Runs	----	----	----	0.71	0.77	0.66-0.99	21
Anaerobic Tests	Dash/Sprints	0.88	0.88	0.88	0.89	0.89	0.85-0.92	9
	Shuttle runs	0.89	0.89	0.89	0.89	0.89	0.83-0.99	2
Muscular Strength and Endurance Tests	1 Repetition Maximum	0.88	0.88	0.82-0.99	----	----	----	2
	Horizontal Jump	0.82	0.82	0.80-0.99	----	----	----	2
	Dips	0.82	0.82	0.82	----	----	----	2
	Vertical Jump	0.81	0.81	0.81-0.99	----	----	----	4
	Hand Grip Strength	0.80	0.80	0.72-0.99	----	----	----	8
	Curl/Pull-ups/Arm hang	0.80	0.80	0.68-0.99	----	----	----	10
	Squat	0.89	0.89	0.70-0.99	----	----	----	7
	Push-ups	0.82	0.82	0.82	----	----	----	1
	Rope Climo	0.80	0.80	0.80	----	----	----	1
	Maximum Repetitions	0.77	0.77	0.66-0.89	----	----	----	2
	Sit-ups	0.65	0.65	0.57-0.72	----	----	----	2
	Functional Tests	Agility	0.81	0.80	0.60-0.87	----	----	7
	Hop	0.87	0.87	0.60-0.87	----	----	----	2
	Obstacle Course	----	----	----	-0.72	0.94	0.60-0.72	2

Backup Slides Subject Area 2: Comparison of Physical Fitness Tests to Job Task Performance								
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APPENDIX L

**National Strength and Conditioning Association (NSCA)
Tactical Strength and Conditioning (TSAC) Program
Blue Ribbon Panel for Military Readiness
April 18-19 2013 Norfolk, VA**

NATIONAL STRENGTH AND
CONDITIONING ASSOCIATION

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NSCA.com

**THE NATIONAL STRENGTH AND CONDITIONING ASSOCIATION'S 2ND
BLUE RIBBON PANEL ON MILITARY PHYSICAL READINESS:
MILITARY PHYSICAL PERFORMANCE TESTING**



THE NATIONAL STRENGTH AND CONDITIONING ASSOCIATION'S 2ND BLUE RIBBON PANEL ON
MILITARY PHYSICAL READINESS: MILITARY PHYSICAL PERFORMANCE TESTING

FORWARD

The National Strength and Conditioning Association (NSCA) was founded in 1978 by 76 strength coaches from across the country with the common desire to network, collaborate, and unify the profession of strength and conditioning. Since its inception, the NSCA has grown to nearly 33,000 Members in 72 countries, and become the leader in the research and education of strength and conditioning professionals. As the worldwide authority on strength and conditioning, the NSCA supports and disseminates research-based knowledge and its practical application to improve athletic performance and fitness.

In 2005, the NSCA founded the Tactical Strength and Conditioning (TSAC) program by working with elite military and law enforcement groups. The TSAC program quickly expanded to include all members of military, law enforcement, and fire & rescue personnel.

The mission of the NSCA's TSAC program is to provide scientifically-sound and safe physical training and educational programs to those who serve and protect our country and communities.

In support of its mission, the NSCA's TSAC program sponsored and hosted the 2nd Blue Ribbon Panel on Military Physical Readiness: Military Physical Performance Testing immediately following the NSCA's 4th annual TSAC Conference on April 18 – 19, 2013 in Norfolk, VA. The 2nd Blue Ribbon Panel was convened to continue the TSAC program's commitment to its mission of providing state-of-the-art physical training and education, and to expand and deliver this information to those who serve and protect our country and communities.

THE NATIONAL STRENGTH AND CONDITIONING ASSOCIATION'S 2ND BLUE RIBBON PANEL ON
MILITARY PHYSICAL READINESS: MILITARY PHYSICAL PERFORMANCE TESTING

EXECUTIVE SUMMARY

This meeting brought together a total of 20 subject matter experts (SME) from the U.S. Air Force, Army, Marine Corps, Navy and academia representing practitioners, operators, researchers, and policy advisors to discuss the current state of physical performance testing across the Armed Services. The SME panel initially rated common military tasks (refer to Table 1) by the degree to which health-related fitness components (e.g., aerobic fitness, muscular strength, muscular endurance, flexibility, and body composition) and skill-related fitness components (e.g., muscular power, agility, balance, coordination, speed, and reaction time) were required to accomplish these tasks. Muscular strength, power, and endurance received the highest rating scores.

The Blue Ribbon Panel then broke into SME groups to establish a list of field-expedient tests (refer to Table 2) that could be considered for military physical performance testing for later voting by the entire panel. Table 2 lists the field-expedient tests that received the most votes by the panel.

Panel discussion centered on whether the services should have a common criteria health-based fitness test (82% of panel members concurred) and whether services should consider a Tier II test focused on both health-related and skill-related fitness components based upon occupational, functional, and tactical military performance requirements (95% of panel members concurred).

It was noted that the Marine Corps currently has a combat-oriented, functional fitness test; however, none of the services currently have an occupationally specific physical fitness assessment. The Army and Air Force have study initiatives considering Tier II fitness tests. Subsequently, the panel discussed the need to consider whether Department of Defense Instruction 1308.3 (DOD Physical Fitness and Body Fat Programs Procedures) should be revised to consider inclusion of Tier II tests to assess functional and skill-related fitness components related to occupational tasks.

CONCLUSIONS:

- 1) Selected fitness components are currently not being assessed by the military.
- 2) Field-expedient options to measure both health-based and skill-based fitness components are available.
- 3) Branches of the military may want to consider having common fitness-based tests. Concern for historical perspective and appropriate health-based criterion reference standards should be given to alter military physical performance testing if needed.
- 4) It seems prudent for each branch of the military to design an occupational, functional, and tactical military performance test for inclusion as part of a fitness testing battery.

RECOMMENDATIONS:

- 1) The Panel will organize a writing group to publish a peer-reviewed manuscript based on the panel findings and proceedings.
- 2) The findings and recommendations from the panel should be briefed to the DoDI owners, Office of the Secretary of Defense/Personnel & Readiness/Morale, Welfare and Recreation Policy Division for consideration to revising DODI 1308.3 DOD Physical Fitness and Body Fat Programs Procedures.

**THE NATIONAL STRENGTH AND CONDITIONING ASSOCIATION'S 2ND BLUE RIBBON PANEL ON
MILITARY PHYSICAL READINESS: MILITARY PHYSICAL PERFORMANCE TESTING**

The opinions expressed at the conference or contained in this paper do not constitute official Department of Defense policy positions or those of the Services.

TABLE 1. COMMON MILITARY TASKS

Military Tasks	Strength	Power	Endurance	Body Composition	Coordination	Balance	Agility	Flexibility	Aerobic Fitness	Speed	Reaction Time
Jump or leap over obstacles	7.5	9	4	6.4	6.9	5.7	6.5	5.9	2.6	5.7	4
Move with agility-coordination	4.7	5.4	5.5	5.8	9.5	8.4	9.8	6.1	4.1	6.5	6.6
Carry heavy loads	8.8	6.2	7.5	5.2	3.7	5	2.9	3.3	5.5	2.2	1.6
Drag heavy loads	9.2	7.4	7.4	5.2	4.5	4.8	3.3	3.8	5.2	2.7	1.6
Run long distances	3.8	3.1	6.9	6.9	3.2	3.2	3	3.2	9.9	4	1.4
Move quickly for short distances	6	7.8	5	6.2	7	6.4	7.8	4.4	4	9.3	6
Climb over obstacles	8.3	6.5	5.7	6.7	7	6.1	6	5.9	3.9	4.1	2.2
Lift heavy objects off ground	9.7	7.7	5.4	5.5	4.8	5.1	2.7	5	3	2.3	1.6
Load/stow/mount hardware	7.7	6	6.3	5	5.7	5.3	3.4	4.9	3.6	2.6	2.2
Overall mean	7.3	6.6	6	5	5.8	5.5	5	4.7	4.6	4.4	3

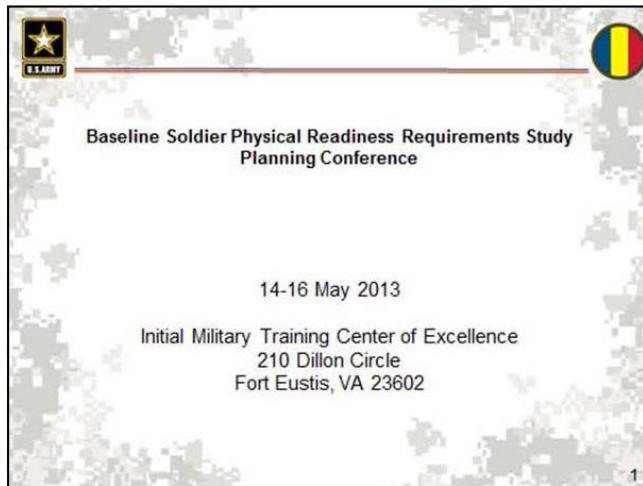
THE NATIONAL STRENGTH AND CONDITIONING ASSOCIATION'S 2ND BLUE RIBBON PANEL ON
MILITARY PHYSICAL READINESS: MILITARY PHYSICAL PERFORMANCE TESTING

TABLE 2. Viable Performance Tests

Fitness Component Field Expedient Options	
Aerobic Fitness	Running Test
	Beep Test
Muscular Strength	Isometric Dynamometer
	Pull-Up
	Incremental Dynamic Lift
	Push-Up
Muscular Endurance	Push-Up
	Burpee (Squat Thrust)
	Squat
Flexibility	Functional Movement Screen
	Sit and Reach
	Y-Balance
Body Composition	Circumference Measurements
	Bod Pod
Speed	40-Yard Sprint
Agility	300-Yard Shuttle Run
	T-Test Agility Drill
Power	Standing Broad Jump
	Vertical Jump
	Medicine Ball Throw
Coordination	Sit-Up and Stand w/o using Hands
	Burpees
Balance	Beam Walk
	Y-Balance
Reaction Time	N/A

APPENDIX M

TRADOC May Planning Conference Brief
Deconstruction of WTBDs



Planning Conference Schedule		
Tuesday, 14 May 2013		
Time	Lead/Facilitator	
0800-0815	Registration/Lunch Selection and Payment	COL Cable/SFC Williams
0815-0830	Welcome	Mr. Haith
0830-1130	Calendar Requirements	Mr. Haith
1130-1230	Lunch On-Site	
1230-1600	Calendar Requirements	Mr. Haith
1600-1630	Wrap Up	Mr. Haith

2

Current Status APRT Study	
• Completing Phase 1 Systematic Review-Brief Results O/a 28 JUNE to CG TRADOC	
– Completing review of existing scientific research	
– Integrating WTBD PRT Survey results into the review	
• Developing and Synchronizing remaining Phases with Soldier 2020 Initiative	
– Developed Study Protocols for Phases 2 thru 5-Synchronizing execution with MOS Physical Standards Timeline	
– Executing Phase 2 Task Identification	
o Create draft task list 14-16 MAY 13	
o Conduct SME Task Selection/validation Boards 11-13 JUN 13	
– Phase 2 Quantify Task Demands- Observe/measure/analyze physical demands 5-30 AUG 13	
– Phase 3 Establish Task Standards Conduct Focus Group Interviews	
o Validate Physical demand standards with stakeholders 24-26 SEP MAY 13	
o Establish final task physical demand requirements NLT 22 NOV	
– Develop potential test events to simulate VTBTD physical demands NLT 28 FEB 14	
– On Track to complete Phase 4 (Event Testing and Validation) NLT JUN 14 and Phase 5 (Determine Final test Events and Validation) NLT APR 15	

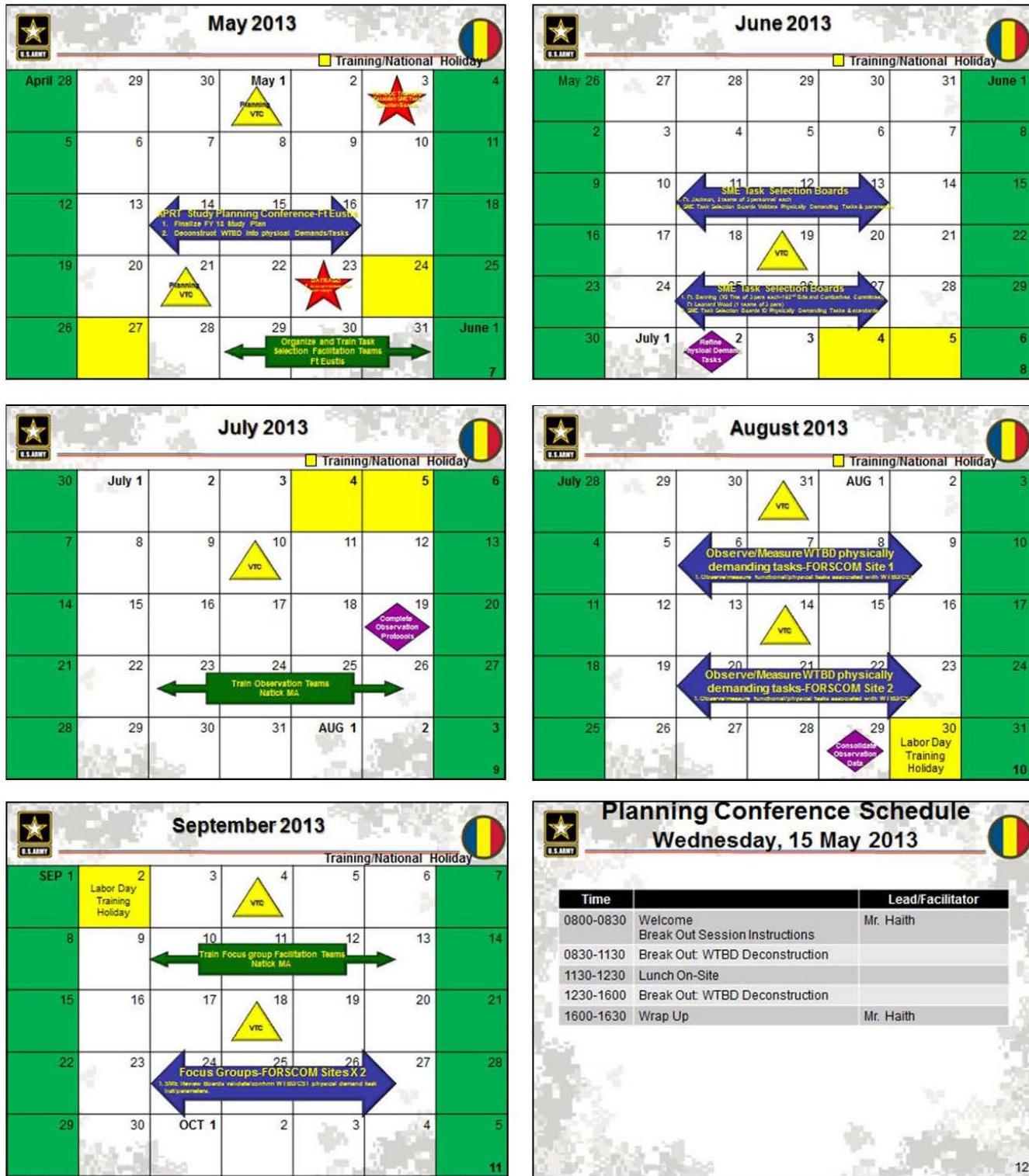
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Study Plan Matrix									
Phase	Task	Lead	Objectives	Next Action	Duration	Location	Lead/Team	Start Date	End Date
Phase 1	1. Define APRT Study Scope	APRT Working Group	1. Define Soldier Physical Readiness Requirements (APRT) Study Scope and objectives 2. Define APRT Study Plan	1. NLT 28 JUN 13	1-10 JUN 13				
Phase 2	2. Define APRT Task Identification	APRT Working Group	1. Develop APRT Task Identification Plan 2. Develop APRT Task Identification Plan 3. Develop APRT Task Identification Plan	1. NLT 28 JUN 13	1-10 JUN 13	Initial Task Identification	APRT Working Group	11 JUN 13	14 JUN 13
Phase 3	3. Define APRT Quantify Task Demands	APRT Working Group	1. Define APRT Quantify Task Demands Plan 2. Define APRT Quantify Task Demands Plan 3. Define APRT Quantify Task Demands Plan	1. NLT 28 JUN 13	1-10 JUN 13	Initial Task Identification	APRT Working Group	11 JUN 13	14 JUN 13
Phase 4	4. Define APRT Task Standards	APRT Working Group	1. Define APRT Task Standards Plan 2. Define APRT Task Standards Plan 3. Define APRT Task Standards Plan	1. NLT 28 JUN 13	1-10 JUN 13	Initial Task Identification	APRT Working Group	11 JUN 13	14 JUN 13

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Phase 4	4. Define APRT Task Standards	APRT Working Group	1. Define APRT Task Standards Plan 2. Define APRT Task Standards Plan 3. Define APRT Task Standards Plan	1. NLT 28 JUN 13	1-10 JUN 13	Initial Task Identification	APRT Working Group	11 JUN 13	14 JUN 13

Study Plan Matrix									
Phase	Task	Lead	Objectives	Next Action	Duration	Location	Lead/Team	Start Date	End Date
10	Decision Brief to CG TRADOC	APRT Working Group	1. Prepare and conduct final functional and physical capacity assessments associated with the Soldier 2020 Initiative demanding WTBD/C 01s 2. Decision Brief to CG TRADOC	1. 16-18 JUL 14 2. 20 JUN 14	1-2 working days	1-2 working days	IMT	16 JUL 14	18 JUL 14
11	Develop Assessment Standards	APRT Working Group	1. Administer functional task simulations to a normative sample of soldiers 2. Determine criterion and normative scores/ scales for functional and physical fitness assessments	1. NLT 27 SEP 14 2. NLT 4 OCT 14	1-2 working days	1-2 working days	ALCON	27 SEP 14	4 OCT 14
12	Launch the new APRT	APRT Working Group	1. Launch the new APRT	1. 23 OCT 14	1 day	1 day	TRADOC	23 OCT 14	23 OCT 14

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Break Out Group Assignments

Break Out Group #1	Break Out Group #2	Break Out Group #3
Mr. Haith (Facilitator)	COL Cable (Facilitator)	Dr. East (Facilitator)
Dr. Zambraski	Ms. Sharp	CPT Henning
CPT DeGroot	CSM Ecker	Dr. Hauret
CPT Soika	Dr. Nindle	1SG Bagwell
Mr. Goddard	Dr. Jones	Mr. Palkoska
SGM Reyes	Dr. Muraca	Mr. Grier
Dr. Purvis	CPT Daniels	

Mr. Fox – lend expertise to all three break outs

WTBDs
Physical Demand, Importance, and Frequency
(n~15,000)

Respondents were asked to indicate how physically demanding/challenging each WTBD is, how important it is for ALL Soldiers to be proficient in each WTBD, and how frequently Soldiers performed each WTBD in a combat environment:

WTBD	Physically Demanding	Importance
Perform Combatives (WT)	1 (most demanding)	16 (last)
Move Under Fire (WT)	2	5
React to Ambush (Near) (BD)	3	7
React to Contact (BD)	4	4
Evacuate a Casualty (WT)	5	3
React to Ambush (Far-FD)	6	8
React to Indirect Fire Dismounted (BD)	7	5
Perform Individual Movement Techniques (WT)	8	12
Perform Immediate Lifesaving Measures (WT)	9	2
Establish Security (BD)	10	6
Employ Hand Grenades (WT)	16 (last)	15 (next to last)

1 – 5: Highest Ranked (most physically demanding, important, or frequently done)
6 – 11: Middle Ranked (moderately physically demanding, moderately important, occurs sometimes)
12 – 16: Lowest Ranked (least physically demanding, important, or least frequently done)

Warrior Tasks and Battle Drills (New)

Shoot	Survive
• Maintain, employ, and engage targets with assigned weapon system (new or reworded)	• React to chemical, biological, radiological, and nuclear (CBRN) attack (new or reworded)
• Employ hand grenades	• Perform immediate lifesaving measures
• Move	• Perform counter IED
• Perform individual movement techniques	• Maintain Situational Awareness (new or reworded)
• Navigate from one point to another	• React to Man-to-Man Contact (new or reworded)
• Move under fire	
• Communicate	Adapt
• Perform voice communications (SITREP/SPOTREP/9-Line MEDEVAC, EXPLOSIVE HAZARD (EH))	• Assess and Respond to Threats (Escalation of Force)
• Use visual signaling techniques	• Adapt to changing operational environments
	• Grow professionally and personally (Build resilience)
Battle Drills	
• React to contact	
• Establish Security	
• Perform actions as a member of a Mounted Patrol	
• Perform Tactical Combat Casualty Care (new or reworded)	
• React to Indirect Fire	
• React to Ambush (near/far)	

TASKS: 15
DRILLS: 8
SUB-Tasks: 81

(Pre-decisional)

Potential Common Soldier tasks

- Conduct Dismounted Tactical Movement (move as a member of a team?)*
- Prepare a Fighting Position (Fill and Emplace Sandbags)*
- Others?

Consolidated Task List

- 071-COM-4407 Employ Hand Grenades* (this task was identified as least physically demanding task in the recent WTBD PRT Survey)
- 071-COM-0501 Move as a member of a Team
- 071-COM-0541 Perform Exterior Movement Techniques during an Urban Operation
- 071-COM-0502 Move under Direct Fire*
- 071-COM-0510 React to Indirect Fire dismounted
- 071-COM-0503 Move over, Through, or Around Obstacles (Except Minefields)
- 081-COM-1046 Transport a Casualty –(Infantry task-Drag a Casualty to Immediate Safety-Dismounted)*
- 071-COM-0006 React to Man-to-Man Contact
- 551-001-1043 React to Vehicle Rollover (this was not identified as physically demanding task in the recent WTBD PRT Survey)
- Physically demanding Tasks- 11, 19, 13F MOS

Breakout Group Assignments

Breakout Group 1	Breakout Group 2
• Conduct Dismounted Tactical Movement (move as a member of a team?)*	• Prepare a Fighting Position (Fill and Emplace Sandbags)*
• Navigate from one point on the ground to another point while dismounted	• 071-COM-4407 Employ Hand Grenades* (this task was identified as least physically demanding task in the recent WTBD PRT Survey)
• 071-COM-0501 Move as a member of a Team	• 081-COM-1046 Transport a Casualty –(Infantry task-Drag a Casualty to Immediate Safety-Dismounted)*
• 071-COM-0541 Perform Exterior Movement Techniques during an Urban Operation	• 551-001-1043 React to Vehicle Rollover (this was not identified as physically demanding task in the recent WTBD PRT Survey)
• 071-COM-0510 React to Indirect Fire dismounted	
• 071-COM-0502 Move under Direct Fire*	
• 071-COM-0503 Move over, Through, or Around Obstacles (Except Minefields)*	
Breakout Group 3	
• 071-COM-0006 React to Man-to-Man Contact (Combatives)	
• 171-COM-0011 Employ Progressive Levels of Individual Force when confronting Civilians	

MOS 11B: Infantryman
071-326-3013 Conduct Tactical Movement









Task: Conduct a 24 Kilometer Tactical Movement

Condition: Wearing / Carrying 128 lb Approach March Load

Standard: Complete in 24 hours; Soldiers do not have to complete the entire 24 kilometers at once.

Conduct Tactical Movement

Carry minimum of 128 lbs evenly distributed over entire body and remain able to fight at conclusion of march of 24 kilometers per day.

Weight: 128 lbs-145 lbs
Horizontal Distance: 24 km
Vertical Distance: 0-2 m
Time: 24 hours

- 128 lbs is combined weight of Basic Soldier Uniform (12 lbs), PPE (68 lbs), 24 hour sustainment load (48 lbs)
- Weight of specialty equipment varies (e.g., 60 mm mortar base plates weigh 18 lbs)
- Patrols remaining in the field overnight or for multiple days increase weight significantly (additional ammunition, food, water, mission essential equipment, etc.)
- Army Standard for Tactical Movement is 3-4 km per hour for a total of 24-32 km per day (24 km is approximately 15 miles)
- 24 km per day is representative of 1-2 Combat Patrols (6-8 km out and 6-8 km back twice a day) from Combat Outposts and Joint Security Sites in the Afghanistan AOR.
- Does not require the Soldier to complete the entire distance at once.

MOS 11B: Infantryman
071-326-5703 Prepare a Fighting Position (Fill and Emplace Sandbags)





Task: Fill Sandbags

Condition: Wearing / Carrying 68 lb Fighting Load(-) (no weapon) and given entrenching tool, 26 empty sandbags, sufficient fill

Standard: 26 sandbags filled 55-60% full in 52 minutes

Fill Sandbags

Dig, lift, and shovel 11 lbs scoops of dirt in bent, stooped or kneeling position into sandbags.

Weight: 11 lbs
Horizontal Distance: N/A
Vertical Distance: 0.75 m
Time: 36-52 minutes

- 11 lbs is combined weight of e-tool and average weight of various soil compositions
- 0.75 meters is height of a sandbag, 3-5 scoops of dirt fill one sandbag
- One hasty fighting position (without overhead cover) utilizes 18-26 sand bags
- 2 minute average to fill a sandbag
- 54-130 scoops required to fill 18-26 sandbags

Task: Carry / Emplace Sandbags

Condition: Wearing / Carrying 68 lb Fighting Load(-) (no weapon) and given 26 sandbags (55-60% full)

Standard: Hasty fighting position (without overhead cover) built in 26 minutes 10 meters from the original position of the sandbags

Carry/Emplace Sandbags

Lift 30-40 lbs sandbags waist to shoulder high, carry them 1-30 m and emplace.

Weight: 30-40 lbs
Horizontal Distance: 30 m
Vertical Distance: Waist-shoulder high
Time: 18-26 minutes
(Urban environment requires lifting/heaving sandbags to multiple storied buildings)

- 30-40 lbs is average weight based on soil composition; bags filled 55-60%
- Sandbags are typically carried/emplaced waist to shoulder high
- 30 meters is farthest distance carried from fill point without a vehicle
- 1 minute estimate to carry/emplace sandbags

MOS 11B: Infantryman
071-325-4407 Employ Hand Grenades



Task: Employ Hand Grenades

Condition: Wearing / Carrying 80 lb Fighting Load and given an M69 Practice Hand Grenade

Standard: Throw Hand Grenade 30 meters



Employ Hand Grenades
Throw hand grenade to engage enemy forces.



Weight: 1 lb Horizontal Distance: 30 m Vertical Distance: N/A Time: N/A	- 1 lb equals the weight of an M67 Fragmentation Grenade - IAW Qualification Standards outlined in FM 3-23.30 Soldiers must be able to engage enemy targets at 35 meters with M67 Fragmentation Grenades - Hand grenades are used more frequently when conducting operations in urban environments (ROE Dependent)
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MOS 11B: Infantryman
071-COM-0503 Move Over, Through, or Around Obstacles



Task: Move Over, Through, or Around Obstacles;
Scale / Climb 2 Meter Vertical Obstacle with Assistance

Condition: Wearing / Carrying 80 lb Fighting Load and given a 2 meter vertical obstacle. If necessary, equipment may be removed, but must be worn / carried after obstacle is cleared

Standard: Obstacle successfully negotiated, with assistance (if needed)



Scale and Climb a 2 Meter Vertical Obstacle
With Assistance

Weight: 80 lbs Horizontal Distance: Varies Vertical Distance: 2 m Time: Varies	Weight: Combat Equipment is 80 lbs Vertical Distance: Common courtyard and compound walls are 2 m; could also be a 2 m vertical obstacle, river bank, or other natural or reinforcing obstacle
---	---

MOS 11B: Infantryman
071-COM-0502 Move Under Direct Fire



Task: Move Under Direct Fire (Rise from a Prone, Kneeling, or Crouched Position; Sprint 3 to 5 Seconds; Return to a Prone, Kneeling, or Crouched Position)

Condition: Wearing / Carrying 80 lb Fighting Load

Standard: Sprint 100 meters in 3 to 5 second increments



Rise from a Prone, Kneeling, or Crouched Position; Sprint for 3 to 5 Seconds While Carrying a Minimum of 80 Pounds Evenly Distributed Over Entire Body; Then Return to a Prone, Kneeling, or Crouched Position

Weight: 80 lbs
Horizontal Distance: 100 m or more
Vertical Distance: N/A
Time: Varies

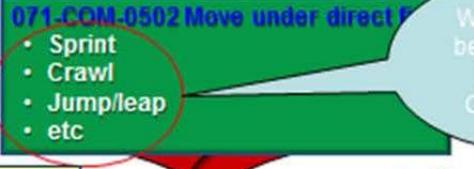
Weight: Combat equipment is 80 lbs
Weight does not include: Platoon TO&E or mission specific equipment or radios

Warrior Tasks and Battle Drills-Deconstruct

Battle Drill-React to Ambush (near)



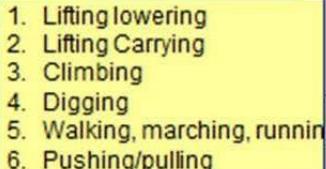
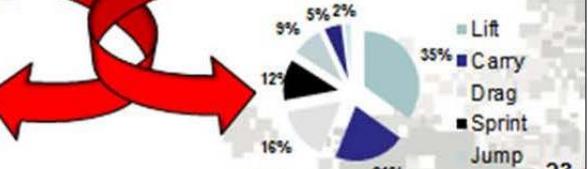
071-COM-0006 React to man-to-man contact
071-COM-4407 Employ hand grenades
071-COM-0501 Move as a member of a team
071-COM-0502 Move under direct fire



071-COM-0502 Move under direct fire

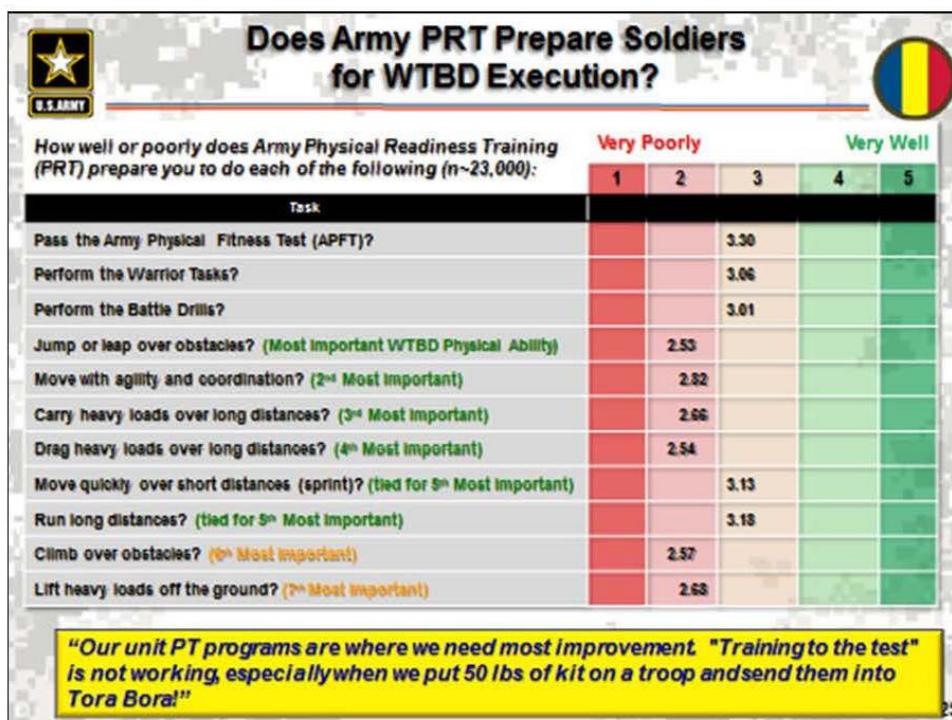
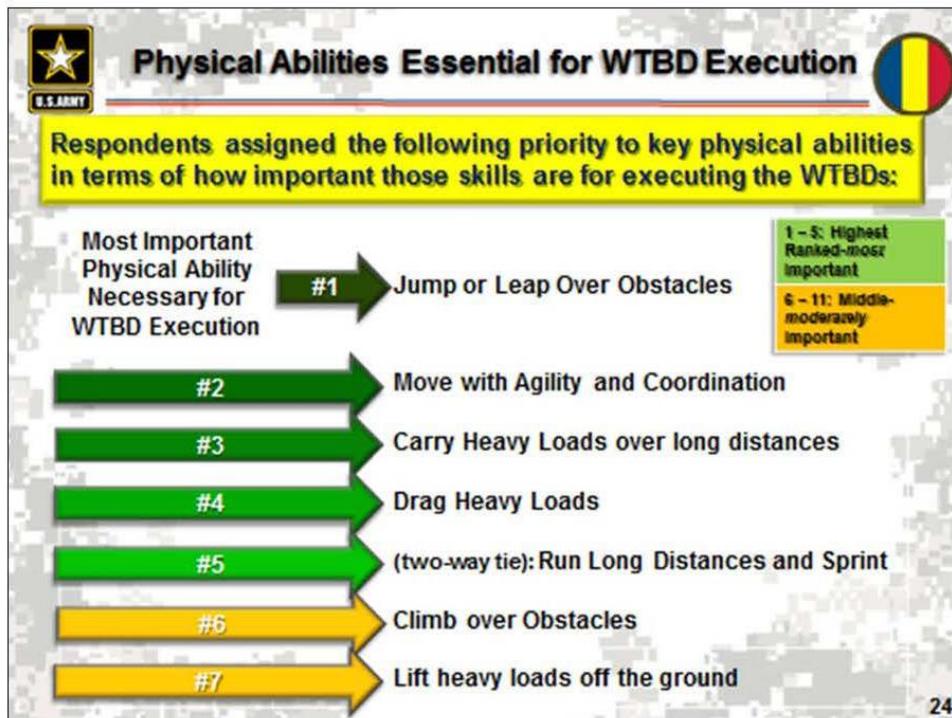
- Sprint
- Crawl
- Jump/leap
- etc

What are the best Physical Demand Categories

Physical Demand Category	Percentage
Lift	35%
Carry	21%
Drag	16%
Sprint	12%
Jump	9%

23



 **Planning Conference Schedule**
Thursday, 16 May 2013 

Time		Lead/Facilitator
0800-0815	Outbrief Introduction	Mr. Haith
0815-0845	Break Out Group 1 Outbrief	
0845-0905	Break Out Group 1 Discussion	
0915-0945	Break Out Group 2 Outbrief	
0945-1005	Break Out Group 2 Discussion	
1015-1045	Break Out Group 3 Outbrief	
1045-1105	Break Out Group 3 Discussion	
1105-1145	Way Ahead Plan	Mr. Haith

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APPENDIX N

Summary and Example Results of Focus Group Sessions June 2013

Focus group sessions were sponsored by TRADOC IMT-CoE and organized by COL Sonya Cable and Mr. Mike Haith. The purpose was to gain insight from the field about conditions under which warrior tasks and battle drills (WTBDs) are conducted and establish baseline standards that every Soldier, regardless of gender or MOS, should be able to meet without special skills or training. The sessions were confidential and only basic demographic information about the participants was obtained. Each focus group began with a discussion lead by IMT CoE staff on problems with the current APFT and the need to connect physical fitness testing with WTBDs. A common theme of discussion and participant comments was regarding the weight of clothing and equipment worn and carried during training and combat. The focus groups were beneficial and provided many insights about the validity of selected WTBDs.

The focus groups were conducted at following:

FT Jackson, 12-13 Jun 2013

USAPHC Personnel: Ms. Karen Deaver (group facilitator) and Mr. Tim Bushman
Three focus groups, totaling of 21 men and 7 women of mixed ranks

FT LeonardWood, 18 Jun 2013

USAPHC Personnel: Mr. Joe Houser (facilitator); Ms. Lauren Lynch (transcriptionist)
Two focus groups, totaling 13 men and 7 women of varying ranks

Ft Benning, 25-27JUN13

USAPHC Personnel Ms. Karen Deaver (facilitator), Ms. Elizabeth Clearfield
(transcriptionist)
Three focus groups, totaling groups 23 men and 2 women of mixed ranks.

The following is an example of the information transcribed from the focus sessions.

EXAMPLE SUMMARY OF FOCUS GROUP RESPONSES AND NOTES

12 June 2013

Fort Jackson, SC Day 1

Morning Session-A

Moderator: Karen Deaver-US Army Institute of Public Health

Transcriber: Tim Bushman-US Army Institute of Public Health

Drill Sergeant of the Year: SGT Heilman

Session Start Time: 8:10, Instruction End: 8:20

Session End Time: 10:50

Number of Participants: 10 (7 males, 3 females)

Conduct Tactical Foot March

Q1: Do you think that the average Soldier, male or female, could march 16 km (10 miles)?

Q2: Do you think that the average Soldier, male or female, could march 16 km (10 miles) in 4 hours (a 2.5 mile-per-hour pace)?

Q3: Do you think that the average Soldier, male or female, could march 16 km (10 miles) in 4 hours while carrying a 128-pound load?

Q4: What do you think that an average, baseline Soldier could accomplish in terms of a foot march? If you had to develop the conditions and standards for the average Soldier, what would they be?

- 1) 16-km is a reasonable distance, general consensus
- 2) From a baseline perspective, Soldiers that just got in, they start at 12 miles, not 10, and they progressively increase distance and load and this was feasible
- 3) Distance is usually 20 km or 12 miles
- 4) They say that 16-km is too low as more conversation transpired
- 5) Probably ought to be 20-km
- 6) 4-hour pace for 10 miles is too slow
- 7) 4-hours for 20-km is good, correct pace
- 8) Would be easier to make the decision based off of what your actual backpack weighs, not the actual load
- 9) No Soldier really incorporates what they wear (bag and kit)
 - a) Two separate equations you have to account for
- 10) 35 pounds for the ruck sack
- 11) 128 pounds and subtract the uniform weight, so roughly a 115-pound load
- 12) ACH, FLC, weapons, boots has nothing to do with the "load" as far as they think
- 13) The actual "weight" should be 35 pounds as far as they consider it
- 14) There is a doctrinal way to think of this: fighting load (FLC) and approach march load (everything) and the middle load is maybe assault load?
- 15) 128 pounds seems excessive for the approach march load, a more acceptable number is 25-35 pounds
 - a) 70-75 pounds for the entire load because the load you're wearing can vary 20-30 pounds depending on what you're carrying

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- b) 70-75 pounds sounds like a general agreement number as far as what a Soldier should be able to carry
- 16) For baseline Soldiers, one of the issues is multiple standards for different body sizes
- 17) It would just be a little easier for the bigger Soldiers and a little harder for the smaller Soldiers
 - a) Soldiers can do it, they just have to build up to it but it is totally possible
- 18) Need to build stamina
- 19) 1/3 of body weight is a general number as far as load to carry
- 20) Building up to it is the key for baseline Soldiers, start out at 2-4-6-8-10-12 kilometers
 - a) Nothing for 2-km, then continually adding more weight to help train for distance and load simultaneously
- 21) 4 hours at the 20-km still makes sense with a full load of 70-75 pounds
- 22) According to Chapter 5 Foot Marches, 21-18 manual, says 72 pounds should be the cap for load
- 23) Regular Army does that, Ft. Jackson doesn't
- 24) Fort Jackson bases it on body weight, generally 1/3 of body weight
- 25) 30-35 pounds average fighting load?
- 26) 30% of body weight, some units do do that outside of the Army
- 27) 35-pound ruck is the set standard for Fit to Fight
- 28) Soldiers need to be able to do this, but there really is no set standard
- 29) Doesn't make sense to have it MOS specific, because every Soldier is a Soldier first
- 30) Hard to establish a standard because everyone does something different (MOS)
- 31) It comes down to enforcement at the end of the day, whatever standard you set forth, you need to enforce that
- 32) Every unit enforces standards based on MOS, and unless all units enforce the same standards, then anything we establish is "air"
- 33) Taking APFT in one unit may be different than taking APFT in another unit
- 34) As a former infantryman, it was "you are going to do this, and it is going to be checked"
- 35) It comes down to ENFORCEMENT
- 36) Karen took the conversation away from enforcement, that is another day's conversation, but today's focus is what are you doing TODAY
- 37) We should expect 20-km in 4 hours with 70-75 pounds in load carriage

Perform Exterior Movement Techniques during an Urban Operation

Q1: In said example, if a Soldier must sprint under load, jump and crouch under load, drop to the prone position under load, and perform balancing acts under load; what different physical components, or physical movements, are involved in this task?

Q2: Considering each physical component described above, how easy or difficult is it to perform? While carrying an 80-pound load? Do you think that the average Soldier, male or female, could perform that physical component with a fighting load? Without a fighting load?

Q3: What do you think an average, baseline Soldier could accomplish in terms of exterior movement during urban operations? If you had to develop the conditions and standards, what would they be?

1. No, not the baseline Soldier (the baseline Soldier wouldn't be doing this?)
2. Just operational, not IET, right after IET though
3. They would never do this in operational anyways

4. What are the physical capabilities that we should expect of the baseline Soldier during unified land operations (Korea, Kuwait to Afghanistan, Northern Africa)
5. Participant thinks this is possible because CTT Training is similar to that above-described scenario, but would never do that on a normal basis
6. If you want to tie these things together, we're not walking, jumping and crawling with the before-stated 70-75 pound load
 - a. If that's the standard for walking or marching, it can't be the standard for more operational tasks
 - b. 15-25 pounds is a reasonable expectation?
7. If you're under fire, you are dropping your ruck sack and running so allow yourself more maneuverable
8. 210 rounds, weapon, radio
9. Whatever the standard issue is, 35-40 pounds
10. 25-30 pounds sounds like a more appropriate standard as far as consensus
11. What other physical things do we need to do aside from the scenario actions:
 - a. Crawl, shoot, pull their own body weight, potentially carry others with this 15-25 pound load
 - b. Pull myself up onto a shelf-type obstacle, sprinting, IMT
12. Of the physical components just described, what can you reasonably do with 15-40 pounds?
 - a. Crawl, but the less weight the better because of the transition between activities and physical components
 - b. If low-crawling with 80 pounds, and then have to get up and sprint, the transition is going to take way too long
 - c. Everybody would rather move FASTER
13. Climbing over walls with 25 pounds, reasonable expectation
14. Climbing over walls with 40 pounds, too much
15. 25-30 sounds okay, 40 pounds is too much, you're asking for issues (that's when you are going to run into issues with the baseline Soldier)
16. What about ascending stairs? What weight is reasonable? 25 is always reasonable, 40 is always a huge stretch, seemingly unacceptable
17. 40 pounds you should be able to do a flight of steps, 60-80 pounds is doable but you are going to naturally slow down
18. For sprinting, weight is certainly an issue
 - a. Lighter is better, especially if you're getting shot at
 - b. Still, 25-35 pounds is okay for the sprint
 - c. Any additional weight and you are going to be zigzagging and not sprinting in a straight line anymore, you're just trying to stay out of harm's way
19. 25-40 range seems generally okay for all warrior tasks and battle drills, anything more seems farfetched and seemingly unrealistic/unreasonable

Move Under Direct Fire

Q1: In said example, what are the different physical components, or physical movements, are involved in the task?

Q2: Considering each physical component described above, how easy or difficult is it to perform? While carrying an 80-pound load? Do you think that the average Soldier, male or female, could perform that physical component with a fighting load? Without a fighting load?

Q3: What do you think an average, baseline Soldier could accomplish in terms of moving under direct fire? If you had to develop the conditions and standards, what would they be?

1. Everything on here is legit, except for the weight
2. Is this the right scenario physically under direct fire? YES, it is a reasonable expectation
3. Is there anything missing as far as physical fitness components? Change magazine
 - a. Generally would be expected to do low and high crawl
 - b. Kneeling behind cover, crouched position depending on cover
4. Reasonable physical components, make sense, but the weight is too much
5. For a reasonable expectation for weight, the weight should be the same
 - a. The weight doesn't change, 25-40 pounds as in the scenario above
 - b. 15-25 pounds for a 15-meter sprint is a total weight that you're carrying
 - i. The distance is okay, but in order to conduct this task 40 pounds is a lot of weight
 - c. Last scenario 25-40 was reasonable, but in this scenario you're shedding some weight and looking at a range of 15-25 pounds
 - d. With a movement to contact task, you want more speed and less weight
 - i. In this particular drill, there is an emphasis of speed and that cannot be achieved with the addition of weight
 - ii. YES, GENERAL AGREEMENT of this opinion
 - e. Putting a weight to testing a baseline Soldier is incorrect altogether, because a baseline weight is going to differ
 - i. It should be a list of gear that you're wearing
 - ii. IBA and rifle all weigh differently from one Soldier compared to another
 - iii. The way to describe these scenarios is not defined by weight, it's defined by equipment
 - f. Plus or minus 20 pounds is a general range of variation for equipment weights between different Soldiers
6. We want to have as little weight on us as possible
7. Every Soldier should be able to carry weapon, ammunition, water, personal protective equipment
8. Scratch the 80-pounds out and replace with fighting load, and the scenario would be accurate
9. If you don't give a weight requirement, then you better spell-out the equipment you expect me to carry
10. If you don't give us a standard, then what are we doing in the Army?
11. Capabilities
12. Task, condition, standard
13. Standard comes into play
14. Personal protective equipment (PPE) is different between units, which causes loads to fluctuate with PPE

15. Think about the scenario at a couple of different weight limits: low crawl, high crawl, changing the magazine, running and sprinting, transition, lifting your body up and down (depends on terrain)
16. In moving under direct fire, is there really a step called 'climb over something'?
 - a. Not generally, you are looking for cover and a concealed position
17. Baseline Soldier cannot crawl with 80 pounds
 - a. Could maybe do it for a minute, but you won't be that successful
 - b. May be good for 20-30 meters
 - c. Not going to do much for anything with 80 pounds
 - d. 80 pounds is a show-stopper
 - e. 80 pounds is not impossible, but if it's used for standardization then 80 pounds is an issue
18. Is 60 pounds reasonable for 150 meters? NO
19. 15-25 pounds is the very reasonable weight
20. When you raise it to 25-35, you can still perform all those physical components but it becomes DANGEROUSLY slower, which is why that weight needs to come down
21. 35 pounds is a tipping point
22. 51 pounds is what one Soldier would wear, not including his radio and knives but he isn't a baseline Soldier
 - a. That's going back to MOS, because it is what he is required to carry
23. 25-40 pounds is our fighting load? Is it a reasonable fighting load? Baseline should be easily 40 pounds, which has a much more general consensus
 - a. Can move or is agile with 40 pounds, so the tipping point is 35-40 pounds
 - b. But 25 pounds means that you dropped your ACH or some other mission-critical equipment so with the addition of a few more things, you're at 35-40 pounds which is reasonable for these physical components for the baseline Soldier
24. Weapons, ammo, PPE is in the 40-pound range
 - a. BASELINE Soldier you stick to 40-pounds
 - i. Incorporate the plus or minus 20 pounds
25. You're never going to make everybody happy with this, but 40 pounds is good
26. Another individual is sticking with 15-25 pounds
27. To perform these tasks optimally, the only addition you want to add is 15-25 pounds
 - a. But to do these tasks with 40 plus pounds on, it's a "spiritual" task
28. TRADOC is behind, participant thinks that we're going backward, we're still training on things that we have already shown we are proficient at
 - a. We already do this, so we need to come up with some newer, different things to forward the training doctrine of the Army
29. Doing these WTBD with 40 pounds you will experience a degree of degradation

React to Vehicle Roll-Over

Q1: In said example, what are the different physical components, or physical movements, are involved in the task?

Q2: Considering each physical component described above, how easy or difficult is it to perform? While carrying an 80-pound load? Do you think that the average Soldier, male or female, could perform that physical component with a fighting load? Without a fighting load?

Q3: What do you think an average, baseline Soldier could accomplish in terms of reacting to vehicle roll-over? If you had to develop the conditions and standards, what would they be?

1. First thing is to take everything you have strapped-on off, keep OTV and whatever else the seat belt will fit around (your "kit")
2. You will not be able to put your chin to your chest, too much stuff
3. 60 pounds would be roughly accurate, not 80
4. If you have your neck guard on, you don't have any room to tuck your chin to your chest
5. Better description is to tuck everything into a ball, "ball-up"
6. Ditching your gear, everything but the helmet because everything you're wearing is going to snag in the vehicle
7. Helmet and weapon
8. You just have to be flexible and agile, IOTV (majority of Army should have these)
 - a. Should have pull tabs?
 - b. Apparently not everyone has IOTV's
 - c. Shouldn't take that much effort to shed that excess equipment and weight
 - d. Unit SOP is everyone has to wear your seatbelt at all times
 - e. Cut the seatbelt, leave your IBA on because you may have to fight
 - f. Others in the convoy will "circle the wagon"
 - g. Another thinks you keep your fighting load on you depending on the threat level
 - h. If time is of essence, you pull off your excess gear and get out
 - i. How smashed up is the vehicle? Is the truck on fire? Is someone on top of you? Are you being engaged?
9. The windows are really small, so trying to get out with all your gear on is rather difficult
10. This is a tough scenario to train on because it varies too much due to the myriad of reasons why a rollover may occur
11. You would have to cover all the scenario to establish SOP's for this type of event
12. What are the physical tasks for getting out of the vehicle?
 - a. You would have to establish some strength to try and open and keep the door open (lifting the door, trying to keep it open)
 - b. The windows on the humvee, probably going out the windshield because the top is no longer available and the doors are pretty narrow spaces
 - c. Look for the quickest way out, which would be the door if it's available
 - d. Is ditching your gear and crawling out of the window something a baseline Soldier can do? Everyone should be able to do this. If it's on its side, you would have to pull and lift the door which may take 2-3 Soldiers. If it's on its roof, you would have to go out the sides
 - e. Realistic scenario: you have 3 or 4 people that are in rough shape, IF your seatbelt is on you are upside down, someone is unconscious, first thing to do is identify the gunner because he is probably dead

- f. This is a realistic expectation for a baseline Soldier, but that's completely different than what will happen in the actual event
 - i. One training scenario with gear, one without
 - ii. Very realistic to expect a baseline Soldier to recover themselves out of a flipped vehicle
 - iii. There isn't a new level of fitness you're asking us to do by executing this task
 - iv. If we can do the previous scenarios, we can do this scenario
 - v. Physical components are the same or similar than the others
 - vi. Don't know what things we're measuring in this task
 - vii. This one is almost our easiest one, it's more mental than physical
 - viii. "What's going on upstairs", meaning it's more important to think clearly than have the physical capacity to do this
 - ix. How are you going to react, can you react?
 - x. Too many variables to make this a training exercise, should just be a unit SOP
 - xi. Much more mental than physical
 - xii. Just rollover, get out, not something you necessarily train on, but you do it in Kuwait before you go to your station
 - xiii. Don't have humvees in Afghanistan, different vehicle systems everywhere
 - xiv. Not everyone has gunners anymore
 - xv. Even State-side, we aren't all driving humvees or tactical vehicles, so don't necessarily have a standard common knowledge

Soldier Load

Q1: Considering the Army Combat Uniform (ACU), what does the average baseline Soldier wear every day, and what would he\she be carrying in the pockets? How much do you think this weighs? The uniform plus other pocket and attached items? Do you think the average, baseline Soldier can function effectively while wearing this much weight?

- 1. Some people shed earplugs, some don't
- 2. Do not need Chapstik
- 3. Gloves can shed
- 4. Underwear can shed
- 5. Eye protection
- 6. Everything minus the sports bra I'm taking
- 7. Left off the multi-tool because not everyone has one, not everyone needs one
- 8. 11.75, 13, 12.13, 11.0, 12.6, 12.4, 12.3, 13.0, within a pound you're looking at 12 pounds roughly
- 9. This seems appropriate as far as weight per equipment
- 10. Most everyone is this room has that much weight right now
- 11. Is there anything missing that you would have in battle? Some form of communication device
 - a. Pound of smart cards
 - b. Weapon and a magazine
 - c. Looking for equipment in garrison
 - d. In garrison you don't need eye pro, ear pro, multi tool, gloves, more comes off the list when 'in garrison' is in effect

- e. Leave the tool or knife
- f. Might want to have your ipro and gloves in garrison
- 12. Chapstick, earplugs, gloves, maybe multi tool in a battle drill can be left behind
- 13. Everything except the sports bra, and maybe not underwear
- 14. You list a notebook, but no pen
- 15. In a battle drill, you have all of this, but maybe not underwear
- 16. This is the BASIC UNIFORM, this is how you show up
- 17. 12-13 pounds sounds good

Q2: Considering the Fighting Load (the ACU plus the gear a Soldier would wear and carry into a situation with potential enemy combatants): what would a Soldier going into a potential combat situation need to wear, carry, and hold in his/her hands? How much do you think this weighs? The uniform plus other items? Do you think the average, baseline Soldier can function effectively while wearing this much weight? What do you think an average, baseline Soldier should be wearing and carrying?

- 1. 45 pounds after shedding a number of items
- 2. 50 pounds
- 3. Kept most of it
- 4. Took off deltoid protector, lower back, protective side plates, waste pack, etool, compass, visual language translator card, goggles, grenade pouches, grenades, seems to concur all-around (these are all items taking out)
- 5. The sling was questionable
- 6. If we're talking about the battles drills vs. just going wherever, we would also take off rhino mount, flashlights, infrared beacon concerning night drills
- 7. Most people kept on body armor, plates, small arm inserts, em4, ACH, magazines, mag pouch, (all must-haves)
- 8. Baseline Soldier fighting load should be around 52.81 on the LOW END
- 9. 52.0 LOW END
- 10. 52.0, 54.5, 47.0 (middle range), 52.0, 48 (low on the body armor), 64 with side plates, 56, 69 with high end numbers for everything
- 11. Someone would keep the grenade pouches, but not the grenades
- 12. Range of 47-69 pounds
- 13. Assuming 50-55 pounds, can you do the tactical foot march with just this weight? YES (20 km, under 4 hours)
- 14. Assuming 50-55 pounds, exterior movements for urban operations? YES crawl, transition, climb the wall (yes and no, you are going to have someone there to help you), (you can do this, but it's going to be slow), with this weight UNASSISTED these tasks, 6-foot wall with 60-70 pounds worth of stuff, is not doable
- 15. At this weight, should the wall be a baseline? NO, because they are not going to be alone and they will have someone there to help me
- 16. Do not remember having to climb a 6-ft wall
- 17. Sprinting with this weight: 15-meters yes, but obviously slower
- 18. Baseline Soldiers should be able to do that, but you haven't given us a standard time? Under double time, yes, absolutely you should be able to do this

19. At 15 meters, the weight doesn't affect the performance as much because it's too short of distance
20. Going up steps, it shouldn't be a problem
21. For moving under fire: not for a baseline Soldier, what can you train them to be able to do after 6 months or so? Yes, after training with the aforementioned fighting loads
22. Should we have our Soldiers saying "this is what you need to do to accomplish the mission?" Is this way too far? Is this realistic? Baseline Soldier in the Army cannot do this, but they should be held to this standard, but it's going to take so much time to get this standard developed that it's "not worth it"
23. Have passed the previously-defined tipping point of 40 pounds?
 - a. Individual movement techniques would render 55 pounds as too much weight
 - b. It would take a unit a considerable amount of time to get that Soldier to achieve these tasks at said weight of 55 plus pounds
 - c. A lot of the Army isn't going to implement this because they have their own mission and agenda
 - d. Baseline Soldiers could NOT do this, general agreement
 - e. They WON'T DO IT
 - f. How many Soldiers get to drill sergeant school and can't perform the tasks and battle drills asked of them
 - g. Not a reasonable expectation that is baseline for the entire Army
 - h. Assuming that the PPE is mandatory, then it's completely different

Q3: Considering the Approach March Load (the Fighting Load plus the gear a Soldier would wear and carry into a protracted mission in a hostile region): what would a Soldier on a multi-day mission in a hostile region need to wear, carry, and hold in his/her hands? How much do you think this weighs? The uniform plus the other items? Do you think the average, baseline Soldier can function effectively while wearing and carrying this much weight?

1. In addition to your 12-13 pound uniform, roughly 50 pound gear
2. This is enough gear for a 48-hour event, what is the load expectancy?
3. 27, 40, 15, 27.6, 33.4, 47.8,
4. Did not carry: ruck, downgrade to medium ruck, intermediate bag, you need mre's, something to carry it in, molee, less mre's,
5. This tells me what we have been doing, but not that it is optimal
6. Leaving out some sustainment items because this is tactical, so the load goes down by half
7. If you're training for a particular mission, such as 20-km in 5 hours, given our load, then a lot of these things articulated on this matrix would be something to sleep in, keep dry, chow, additional ammunition, radio, map
8. Two-day patrol that is a combat patrol, you aren't taking a sleeping bag because you won't be sleeping (travel light and freeze at night, sucks to be you for two days)
9. No more molee ruck sacks, just three-day packs
10. Molees are stupid, molee rucks
11. Molee rucks suck
12. Three-day pack is close to the old system ruck, more realistic

13. In some circumstances the ruck may be essential to the mission and survival (Alaska), there is a reason to have it in some instances
 - a. For baseline Soldier, this is not necessary
14. Two points: fitness as it applies to warrior tasks and battle drills, there are some other avenues that physical fitness gets to: is there a level of fitness to be achieved that helps us with suicide prevention or increases self-esteem? Multiple civilian studies that have found that daughters that are raised with higher levels of fitness have higher levels of self-esteem and don't get into situations where sexual assault becomes an issue? There is another component, not just towards mission, that makes the Army more resilient against suicide, sexual assault, etc.
15. NO ONE agrees that just the PT test and weapons test is good enough to get into the Army
16. With all of this, we have to define what an Army thinks a Soldier should be which always comes down to MOS-specific, which makes us weaker
17. Marines all call themselves Marines, but the Army does not all call themselves Army, they define it by MOS (I'm an infantryman, I'm a mechanic I'm a ...)
 - a. In the Marines, it's I'm a Marine and I'm a Marine and I'm a Marine
18. We basically train to 2/9 tests to pass BCT (fitness test and arms test), but we need to change this

Mike Haith's Presentation – Key Points

- We need to get back to COMPETITION and allowing squad leaders to gauge their own unit's physical fitness
 - Reinstitute competition
- We need to train "in-kit"
- Where do you draw the line with training and injury risk?
- No tactical training in NCOIS
 - Any school in quartermaster course is the same
 - Not getting the training in school to be able to relay that education and training
- Should be able to have a workout of the day with crossfit, TRX, etc.
- No more "one-size-fits-all" approach
- Need for DIFFERENTIATION AND COMPETITION

APPENDIX O

Baseline Soldier Physical Readiness Requirements Study
TRADOC in Process Review (IPR) Brief
19 August 2013
Presented by Mike Haith, TRADOC IMT-CoE

Soldier Baseline Physical Readiness Requirements Study
IPR
DCG IMT
19 AUG 2013

"It [PRT] may not be the most important thing we do in a day, but it's the most important thing we do everyday"
CPT Nicholas Bilotto
Company Commander, TF Spader, Kunar Province, 2011

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Event Selection

CRITERIA FOR SELECTING TEST EVENTS.*

- For military purposes, tests selected should measure the various factors in physical fitness which are essential to military fitness. The most important of these are muscular strength, muscular endurance, cardio-respiratory endurance, agility, and coordination.
- Test events should be selected which require a minimum of equipment. Necessary equipment must be easy to procure and set up.
- Test events should be capable of administration with a maximum economy of time.
- Test events which are dangerous to the unskilled or poorly conditioned men should not be included.
- Test events used should depend as little as possible upon previously learned skills. The purpose of physical fitness tests is to measure the various components of physical fitness, not to measure acquired skills.
- Test events should be such as can be scored on a point table. When tests are scored with points, men are strongly motivated to improve their scores.
- The test in its entirety should be such as to distinguish clearly between the fit and unfit individuals. Test results obtained from fit groups should be consistently better than those obtained from poorer groups.
- Testing on Mondays or on the day after pay day should be avoided.

*1946 Army Physical Fitness Manual

Agenda

- Review
- Phase 2 Task Identification/Task Demands
 - Ft Jackson physical demand rehearsal testing 21-30 AUG
 - Ft Carson physical demand testing 12-27 SEP
- Way Ahead-FY 14 and beyond

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Phase 2: Task Identification and Task Demands

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graph LR
    subgraph May13 [May 13]
        A[Step 1: SMEs & Stakeholders]
        A --> B[Step 2: Validation Focus Groups]
    end
    subgraph Jun13 [JUN 13]
        B --> C[Step 3: Observations of WTBD]
    end
    subgraph Oct13 [OCT 13]
        C --> D[Step 4: Stake Holder Focus Groups]
    end
    subgraph Sep13 [SEP 13]
        D --> E[Step 3: Observations of WTBD]
    end
    subgraph Nov13 [NOV 13]
        E --> F[Step 4: Senior Review Panel]
    end
    subgraph Dec13 [DEC 13]
        F --> G[Step 4: Brief CG TRADOC for Decision]
    end

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Phase 2 Step 1: ID Physically Demanding Warrior Task and Battle Drills FY 13

Shoot

- Maintain, employ, and engage targets with assigned weapon system (new or reworded)
- Employ hand grenades

Move

- Perform individual movement techniques
- Navigate from one point to another
- Move under fire

Communicate

- Perform voice communications (SITREP/SPOTREP/9-Line MEDEVAC, EXPLOSIVE HAZARD [EH])
- Use visual signaling techniques

Survive

- React to chemical, biological, radiological, and nuclear (CBRN) attack (new or reworded)
- Perform immediate lifesaving measures
- Perform counter IED
- Maintain Situational Awareness (new or reworded)
- React to Man-to-Man Contact (new or reworded)

Adapt

- Assess and Respond to Threats (Escalation of Force)
- Adapt to changing operational environments
- Grow professionally and personally (Build resilience)

Battle Drills

- React to contact
- Establish Security
- Perform actions as a member of a Mounted Patrol
- Perform Tactical Combat Casualty Care (new or reworded)
- React to Indirect Fire
- React to Ambush (near/far)

Task: 16 DRILL: 6 SUB-Tasks: 81

Physically Demanding tasks

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Phase 2 Step 1: ID Physically Demanding WTBD

071-COM-4407 Employ Hand Grenades* (identified as least physically demanding task in WTBD PRT Survey)
071-COM-0501 Move as a member of a Team
071-COM-0541 Perform Exterior Movement Techniques during an Urban Operation
071-COM-0502 Move under Direct Fire*
071-COM-0510 React to Indirect Fire dismounted
071-COM-0503 Move over, Through, or Around Obstacles (Except Minefields)
081-COM-1046 Transport a Casualty-Drag a Casualty to Immediate Safety-Dismounted*
071-COM-0006 React to Man-to-Man Contact
551-001-1043 React to Vehicle Rollover (not identified as physically demanding task in WTBD PRT Survey)
071-COM-1006 Navigate from one point on the ground to another point while dismounted

Other Physically Demanding Common Soldier Tasks

- Conduct Dismounted Tactical Foot March (Conduct Tactical Movement*)
- Prepare a Fighting Position (Fill and Emplace Sandbags)*
- Drag a Casualty to Immediate Safety-Mounted

* Physically demanding Tasks- 11, 19, 12B, 13F MOS

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Phase 2
Step 2: Focus Group Results

Findings:

- Initial Task List and description "about right"
- To properly assess fitness-WTBD scenarios require task execution in sequence with little rest while under load and fatigued (pre-fatigue)
- Participants very concerned with Soldier's Load
 - Mission risk vs. protection
 - Loads too heavy
 - Compromises mobility
 - Degrades performance
 - Recommended not less than 25 lbs but no more than 60 lbs (conflicts with list of equipment selected)

Recommendations:

- Create composite task scenarios for Step 3-Observations
- Retain Foot march as physically demanding task
- Modify "Prepare Fighting Position" task to include fill, lift, carry and stack sandbags
- React to man to man contact is situational specific and high injury risk; include capacity tasks of lift, pull, and push
- Omit the following tasks from Step 3-Observations
 - Employ hand grenades (USMC CFT has hand grenade throw?)
 - React to vehicle rollover

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Phase 2
Step 3: Observation Phase

Observations Phase

When AUG-SEP 2013
Administer WTBD/Common Soldier Task performance scenarios to Soldiers.

- Soldiers execute a tactical foot march and a series of tasks designed to simulate physical dynamics of, and weight carried/moved while performing, WTBDs in a combat environment.

What
Data collection will include:

- Soldier gender, height, weight, combat experience, most recent APFT event scores
- Soldier load (actual weight of uniform plus standardized loads)
- Time-to-complete tasks under different experimental conditions (given time standard vs. "do until complete")
- Perceived physical exertion plus heart rate
- Perceived combat relevance/reality of movements executed during task simulations

Where
Ft Jackson pilot/rehearsal (21-20 AUG 2013)
Ft Carson (12-27 September 2013)

Why
Validate SME and Focus Group WTBD/Common Task Scenarios-Are the movements/loads in the scenarios consistent with executing WTBDs in combat?
Observe and record physical dynamics of WTBD performance to inform development of Field Expedient Test menu (potential items for new physical fitness test)
Establish WTBD/CST Scenarios as authentic measures to validate the new APRT/ACRT test events

Representative Physically Demanding WTBD

- Conduct Tactical Foot March
- Move over/under/around/through
- Prepare a fighting position
- Casualty extraction - drag to safety - dismounted
- Perform combatives

Physically demanding WTBDs included in those above:

- Move under direct fire (#2)
- React to Indirect Fire (#2)
- Move as a member of a team (#1, 2)
- Navigate Point to Point dismounted (#1, 2)
- Perform IMTs on Urban Terrain (#1, 2)
- Drag a casualty to safety - mounted (#4, 5)

WTBDs that do not meet the criteria for physically demanding:

- Employ hand grenades
- React to vehicle rollover

Step 3: Observations of WTBD

Ft Jackson Pilot Testing Schedule:

- 22-23 AUG – set up WTBD/CST simulations
- 26 AUG – Brief participants, inspection, practice
- 27 AUG – test (1) move over/under/around/through and (2) combatives simulation
- 28 AUG – test (3) casualty evacuation and (4) fighting position
- 29 AUG – Road March and (1-4) composite simulation
- 27-29 AUG – AAR and Questionnaire follows each testing session

Schedule 26-28 AUG:

0700	Report to testing site
0710	Equipment inspection
0720	Active Warm-up
0730	Testing
0930	AAR discussion
1000	Dismissed

Schedule 29 AUG:

0600	Report to testing site
0610	Equipment inspection
0620	Active Warm-up
0630-0930	Road March (staggered)
0845	Composite Simulation
1045	AAR
1200	Dismissed

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Phase 2 Step 3: Soldier's Load Scenario

Fighting Load (FL): Uniform + Personal Protective Equipment

12.4 lbs Uniform	12.4 lbs PPE
49.6 - 79 lbs Fighting Load	88.6 - 122.4 lbs Fighting Load

Tactical Foot March Load: FL + Sustainment Load

12.4 lbs Uniform	12.4 lbs PPE
44.3 - 79 lbs PPE	59.3 - 103 lbs Fighting load
+40 lbs (Sustainment Load)	+108-122.4 lbs (Sustainment Load)

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Conduct Tactical Foot March

Task: Conduct a 10 km tactical foot march

Condition: Wearing/carrying 80/103-lb Approach March load

Standard: Complete in 2 hours

Scenario

Soldier conducts a 10 km tactical foot march in 2 hours while carrying a 80/103 pound load. That equates to 6+ miles in 2 hours, or a 3 mph pace.

10 km Tactical Foot March

Move Over, Under, Around, and Through Obstacles

Task: Move Over, Through, and Around Obstacles

Condition: Wearing 80 lb Fighting Load; if necessary, equipment may be removed, but must be worn/carried after obstacle is cleared

Standard: Obstacles successfully negotiated, without assistance

Scenario

Soldier with an 80-pound Fighting Load executes 9 skills: (1) sprints 10m, (2) low crawls 10m, (3) zig-zag run 30 m jumping over 2 low obstacles and negotiating 8 tires, (4) traverses 20' balance beam with load, (5) mounts a 48" platform with load, (6) high crawls 5m, (7) climbs over a 54" barrier (8) negotiates 3-high, 2-low obstacles, (9) and sprints 10m. Time to completion is 3 minutes.

Move Over-Under-Around-Through

Physical Attributes:

- Speed
- Anaerobic endurance/power
- Muscular strength/power
- Core stability
- Dynamic Balance
- Agility

Prepare a Fighting Position

Task: Prepare a Fighting Position

Condition: Wearing/carrying 80 lb Fighting Load, ground-level on sand or soil

Standard: Dig/fill 2-4gal containers with sand and transfer 5m to 2-55gal containers until they are full. Lift/carry/stack 16 sandbags.

Scenario

Soldier with 80-pound Fighting Load prepares temporary fighting position. Soldier uses E-tool and digs from the bent or stooped position, to fill two transport container weighing 40 lbs when full. Soldier transfers sand to a 55gal container until they are full. Soldier then lifts/carries 16 40lb sand bags and stacks them on a 30" platform to build a 4x4 sandbag wall. Time to completion is 10 minutes.

Prepare a Fighting Position Simulation

Physical Attributes:

- Muscular endurance
- Aerobic endurance
- Muscular strength
- Core stability
- Dynamic Balance

Casualty Extraction – Drag to Safety, Dismounted

Task: Drag a Casualty to Safety, Dismounted

Condition: Wearing/carrying 80 lb Fighting Load, unobstructed drag-course, non-responsive casualty

Standard: Extricate and drag a 220-pound (bodyweight plus Fighting Load) non-responsive casualty 30 meters.

Scenario

Wearing an 80-pound Fighting Load Soldier rises from a prone position of safety and sprints 15m. Soldier moves around a barrier and crouch runs 15m to a disabled HUMVEE with a 220lb casualty belted into the drivers seat. Soldier removes the casualty from the HUMVEE executing a controlled lowering to the ground and grabs pull strap on casualty's pack, rises to crouched position, and uses two hands to drag the casualty 30 meters to safety. Time to completion is 2 minutes.

Casualty Extraction and Drag Simulation

Physical Attributes:

- Grip Strength
- Rotational Power
- Lower Body Speed/Power
- Upper/lower body strength
- Pull Power (upper/lower)



Perform Combatives





Task:	Perform Combatives
Condition:	Wearing/carrying 35lb load, unobstructed push-course.
Standard:	Execute three basic physical tasks that simulate the strength and power required to perform combatives

Scenario

In combat gear Soldier executes the four physical tasks that simulate the strength/power required to perform combatives: 1) push a load of 200lbs, (2) throw four 20lb sandbags over a 54" barrier from behind a 1m retaining wall, (3) control a loaded sled through a zig-zag pattern, 4) rotate a 550lb barrel 360° x 2 clockwise and x2 counter-clockwise by grasping the handles about shoulder height in a crouch position.



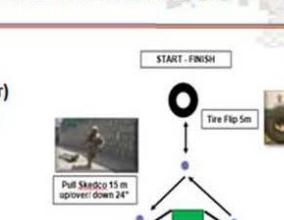


• **Physical Attributes**

- Push Power (upper/lower)
- Pull Power (upper/lower)
- Grip Strength
- Speed
- Lifting Power
- Rotational Power



START - FINISH



PULL SKATES 15 m up/down 24°

TIRE FLIP 5m

Sand Bag Toss - throw 4-10kg sandbags over 15m and land behind the 1m restraining line

15m

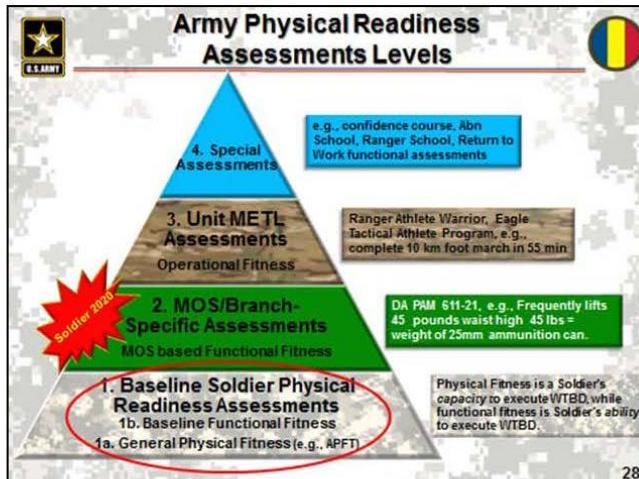
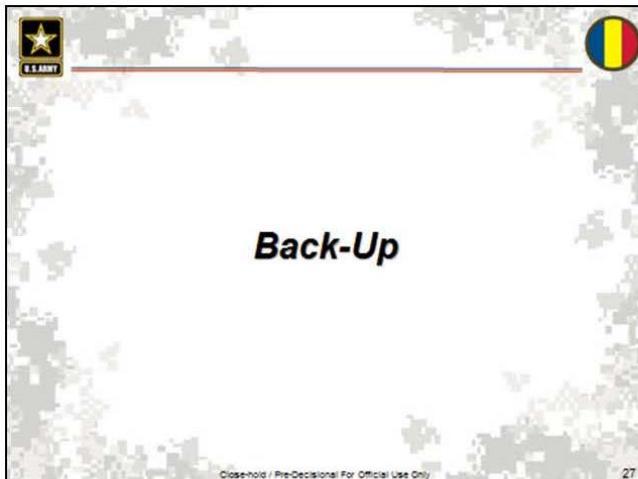
15m

15m

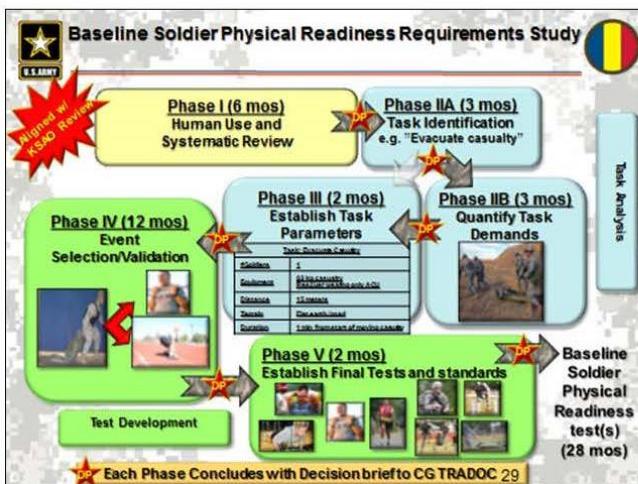
15m

Barbell Rotational grasp handles of 55 kg and rotate 4x clockwise and 4x counter clockwise

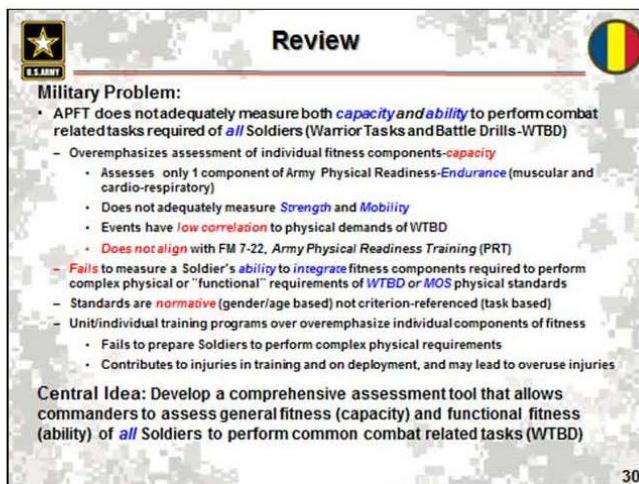
MONTH	ACTION
OCT/NOV	Conduct Stakeholder Focus Groups (socialize Carson findings, solicit input v. field expedient test of capacity and redundancies in the physical aspects of the WTBDs)
NOV	Conduct Senior Leader Panel (socialize Focus Group findings, solicit input v. feasibility of field expedient test of capacity and redundancies in the physical aspects of the WTBDs)
DEC	IPR Brief to CG TRADOC
JAN	Finalize list of field expedient tests of capacity; finalize field simulation of functional tasks.
FEB – MAR	Determine reliability of field expedient/simulations
APR – JUL	Administer functional field simulations + field expedient capacity tests to Soldiers at four FORSCOM sites ($n = 2000$)
AUG – SEPT	Develop recommendations for tests of capacity and function
SEPT	Present findings to Senior Leaders



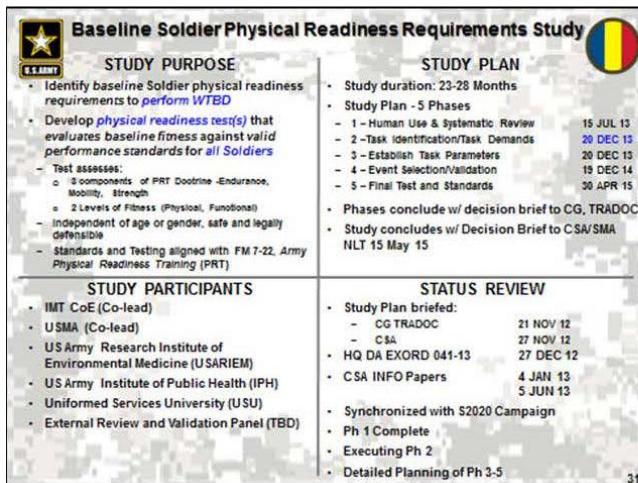
28



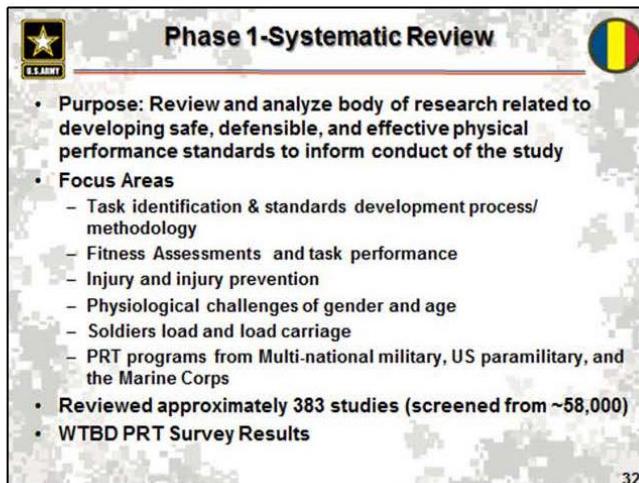
30



30



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Phase 1 Findings (1 of 2)

U.S. ARMY 

- Systematic Review validated study plan and methodology
 - Systematic Review validated study plan and methodology
 - Methodology follows widely accepted practices: 1) what are the tasks 2) what are the demands 3) How should we test the demands
- Fitness assessments and task performance
 - Valid and predictive tests exist for aerobic, anaerobic and muscular strength and endurance to assess general physical fitness (capacity)
 - No "gold standard" tests exist to measure Functional fitness (ability)
 - Military tasks and activities (e.g., run, sprint, lift) are common components of WTBD performance but *in isolation* do not reflect complex physical demands required to perform WTBD—**EXCEPTION:** Casualty Drag & Loaded Foot March
- Injury and injury prevention
 - Twice as many deployed Soldiers AIREVAC for non-battle injury (34%) than for battle injury (17%)
 - Physical activity accounts for 58% of non-battle injuries requiring air evacuation:
 - 1. Physical training and sports -22% (1/2 due to running)
 - 2. Falls and Jumps -17%
 - 3. Near-falls (slips and trips)-8%
 - 4. Lifting, pushing, and pulling-5%
 - 5. Other Overuse Injuries-3%
 - Fatigue is a major underlying cause of injury
 - Low Aerobic fitness consistently and strongly associated with musculoskeletal injury
 - Threshold exists above which more physical activity increases injury risk but not fitness—**"more is not better"**

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Phase 1 Findings (2 of 2)

U.S. ARMY 

- Physiological challenges of gender and age
 - Performance does not appear to decline measurably until 36-40 years old
 - Women face several physiological challenges in performing military tasks compared to men
 - Women at higher risk for Musculoskeletal Injuries
 - Higher Relative work load (exertion) in women leads to exhaustion faster and risk of injury
 - Proper training and nutrition can mitigate challenges but cannot completely overcome gender inequity
- Soldiers load and load carriage
 - Emotional topic amongst soldiers (Phase 2 focus groups)
 - Performance of WTBD is under load and often performed in conjunction with tactical movement
 - Performance of military tasks (WTBD) degraded by load carriage-impaired mobility, effects of pre-fatigue, and higher risk of injury
 - There is threshold where load carriage leaves soldiers unable to perform military tasks*
 - Physical and functional fitness training and testing must account for load carriage degradation*
 - Muscle strength and aerobic capacity must be trained progressively in addition to frequent (2-4 times per month) loaded foot marches to improve load carriage and reduce injuries

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Comparing Physically Demanding Tasks

U.S. ARMY 

	Canada	Dutch	British	Australia	US Army	Marines
Sea Evacuation						X
Land Evacuation						
Low-High Crawl						
Digging	X	X	X		X	
Lifting/Carrying	X	X	X	X	X	X
Road March	X	X	X	X	X	X
Fire & Maneuver	X	X		X	X	X
Kneel-to-stand		X			X	
Climbing				X	X	
Pushing/Pulling					X	X
Evacuate a casualty	X			X	X	X

35

WTBD PRT Survey Results
Physical Demand, Importance, and Frequency (n=28,000)

U.S. ARMY 

Respondents were asked to indicate how physically demanding/challenging each WTBD is, how important it is for ALL Soldiers to be proficient in each WTBD, and how frequently soldiers performed each WTBD in a combat environment:

WTBD	Physically Demanding	Importance
Perform Combatives (WT)	1 (most demanding)	16
Move Under Fire (WT)	2	5
React to Ambush (Near) (BD)	3	7
React to Contact	4	4
Evacuate a Casualty	5	3
React to Ambush (Far)	6	8
React to Indirect Fire Dismounted	7	9
Perform Individual Movement Techniques	8	12
Perform Immediate Lifesaving Measures	9	2
Establish Security	10	6

1 – 5: Highest Ranked (most physically demanding, important, or frequently done)
6 – 11: Middle Ranked (moderately physically demanding, moderately important, occurs sometimes)
12 – 16: Lowest Ranked (least physically demanding, important, or least frequently done)

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Physical Abilities Essential for WTBD Execution

U.S. ARMY 

Respondents assigned the following priority to key physical abilities in terms of how important those skills are for executing the WTBDs:

Most Important Physical Ability Necessary for WTBD Execution	#1	Jump or Leap Over Obstacles	1 – 5: Highest Ranked-most important
	#2	Move with Agility and Coordination	6 – 11: Middle-moderately important
	#3	Carry Heavy Loads over long distances	
	#4	Drag Heavy Loads	
	#5	(two-way tie): Run Long Distances and Sprint	
	#6	Climb over Obstacles	
	#7	Lift heavy loads off the ground	

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Does Army PRT Prepare Soldiers for WTBD Execution?

U.S. ARMY 

How well or poorly does Army Physical Readiness Training (PRT) prepare you to do each of the following (n=23,000):

Task	Very Poorly	1	2	3	4	Very Well
Pass the Army Physical Fitness Test (APFT)?					3.30	
Perform the Warrior Tasks?					3.06	
Perform the Battle Drills?					3.01	
Jump or leap over obstacles? (Most Important WTBD Physical Ability)				2.53		
Move with agility and coordination? (2 nd Most Important)			2.32			
Carry heavy loads over long distances? (3 rd Most Important)			2.66			
Drag heavy loads over long distances? (4 th Most Important)		2.54				
Move quickly over short distances (sprint)? (Tied for 5 th Most Important)			3.13			
Run long distances? (Tied for 5 th Most Important)			3.18			
Climb over obstacles? (6 th Most Important)		2.57				
Lift heavy loads off the ground? (7 th Most Important)	2.68					

"Our unit PT programs are where we need most improvement. "Training to the test" is not working, especially when we put 50 lbs of kit on a troop and send them into Tora Bora!"

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Perform Exterior Movement Techniques during an Urban Operation

Task: Perform Exterior Movement Techniques during an Urban Operation

Condition: Wearing/carrying 80-pound Combat Load over uneven terrain with the enemy's strength and location uncertain

Standard: Move as member of a team within an urban area using proper urban movement techniques while minimizing exposure to enemy fire

Scenario

Dismounted Soldier moves as a member of a team within an urban area. Soldier must minimize exposure to enemy fire. Enemy location and strength are uncertain. Soldier wears/carry's an 80 lb Fighting Load (individual weapon with ammunition; individual protective equipment), and travels 100 meters in the following sequence: (1) sprints 15 m across street, (2) moves 15 m along wall, with multiple jumps over street level window and multiple wall level crouches to avoid open window, (3) assumes prone at corner, (4) stands and sprints to base of 2 m wall (1.5m), and (5) crosses 2 m wall unassisted. This sequence may be repeated 3 times.

Considerations

different physical components of this task: Soldier sprints under load, drops to the prone position under load, keeps his or her balance, and a few more things.

What different physical components, or physical movements, are involved in this task?

How easy or difficult are these components? Can the average Soldier execute? Under load?

Conduct Tactical Foot March

Task: Conduct a 16 km tactical foot march

Condition: Wearing/carrying 128-pound Approach March load

Standard: Complete in 4 hours

Scenario

Soldier conducts a 16 km tactical foot march in 4 hours while carrying a 128 pound load. That equates to 10 miles in 4 hours, or a 2.5 miles-per-hour pace, under a 128 pound load.

Considerations

distance: Do you think that the average Soldier, male or female, could march 16 km (or 10 miles)?

pace: Do you think that the average Soldier, male or female, could march 16 km (or 10 miles) in 4 hours – a 2.5 mile-per-hour pace?

load: Do you think that the average Soldier, male or female, could march 16 km (or 10 miles) in 4 hours while carrying a 128-pound load?

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Phase 2

Step 2: Focus Group Validation

We cannot determine if Soldiers are physically fit for battle until we determine what Soldiers do on the battlefield.

Purpose

- Gather information on how WTBD and other Common Soldier Tasks are executed
- Validate WTBD/Common Task scenarios developed by the SME Board 14-16 May

Procedure

- 7 focus groups, 7-to-18 participants each, conducted at Forts Jackson, Leonard Wood and Benning
- Facilitator guided each group through a series of scripted questions about Soldier Load, and WTBD/ Common Task scenarios.
- Key Question:** To what extent do scenarios accurately reflect how Soldiers physically execute WTBD in combat?

Participants (n=71)

Rank	Gender	Time in Service	Branch*	Deployments
SPC: 1 (1%)	Male: 56 (79%)	Range: 3-27 years	Branch: 14 years	Range: 0-4 times
SGT: 5 (7%)		Avg: 14 years		Avg: 2.4 times
SFC: 18 (25%)		3-5 years: 4%		96% of Participants
SFC: 13 (19%)		6-10 years: 20%		deployed at least
1SG: 14 (20%)		11-15 years: 28%		one time. In the past
SGM/SMS: 4 (5.6%)		16-20 years: 24%		10 years.
1LT: 1 (1%)		21-25 years: 14%		0 times: 4%
CPT: 11 (15%)		25+ years: 1%		1 time: 20%
LTC: 4 (5.6%)				2 times: 28%
				3 times: 32%
				4 times: 15%

Phase 2 Step 2: Soldier Load Results: Fighting Load

Standard Item (Infantry School List)	% of Soldiers indicating they would wear/carry	Standard Item (Infantry School List)	% Wear/Carry
Body Armor with Neck/Orion Protector	81.10%	Infrared Signal Beacon, PHOENIX with Battery	65.57%
Defend Protector	16.67%	Ballistic Knee/Elbow Pads	42.22%
Lower Back Assembly	23.51%	Combat Gloves	75.19%
Enhanced Small Arms Protective Inserts	80.99%	Visual/Language Translator	55.71%
Enhanced Side Ballistic Insert set with Side Plate Carrier	57.14%	Casualty Feeder Report/Wireless	53.21%
MOLLE Assault Pack	57.14%	Advanced Combat Helmet (ACH)	20.41%
MOLLE 100 oz Hydration System (with Water)	95.24%	Helmet Cover w/Camo/Flage	83.55%
MOLLE Tacticon Assault Panel (Battalion Commander)	83.33%	Night Vision Goggle Mounting	53.55%
MOLLE 20 Round Double Magazine Pouch (3 x 0.36)	55.71%	Military Combat Eye Protection (MC2) Goggles	43.24%
MOLLE 50 Round Triple Magazine Pouch (2 x .375)	69.09%	M4 Carbine w/Fully Loaded Magazine	92.85%
MOLLE Waist Pack	23.51%	M88-C/CO with Battery	50.55%
Hand Grenade Pouch (2) with (2) M87 Fragmentation Grenades	73.81%	1 Point Biting	75.57%
Entrenching Tool with Carrier	21.43%	Strap Cutter with Sheath	64.15%
Lensatic Compass with Case	69.09%	Back-Up Iron Sight	75.57%
Individual First Aid Kit (IFAK)	95.24%	M4 RA 8.5. Fwd Pistol Grip	51.55%
Mag Light Flashlight with 2 ea AA Battery	55.71%	6.6mm Magazine with 30 rds	55.24%

FG Participants were asked to indicate if they routinely did (or would) wear/carry the common Fighting Load items in a combat environment.

Infantry School Weight:
80 lbs (82.8 lbs)*
(68 lbs + 12 lbs uniform)

Soldier Vote Weight:
72 lbs
(60 lbs + 12 lbs uniform)

Difference:
-8 lbs

*Infantry School modified load weight estimates after Focus Groups were conducted

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Phase 2 Step 2: Soldier Load Results: Tactical Foot March Load

Standard Item (Infantry School List)	% of Soldiers indicating they would wear/carry
Wet/Com Weather Gear	61.90
Sleeping System: Patrol Bag	87.14
Sleeping System: Intermediate Bag	23.57
Sleeping System: Bivy Cover	57.14
Sleeping System: Small Stuff Sack	40.48
Sleeping System: Large Stuff Sack	21.43
MRE x8	80.95
MOLLE Ruck – MEDIUM (includes: Frame, Shoulder Straps, Waist Belt, Sustainment Pouch x2)	75.57
Water – 3L or 100 oz	80.95
Hygiene Kit	73.51
Spare Batteries	71.43

FG Participants were asked to indicate if they routinely did (or would) wear/carry the common Tactical Foot March Load items in a combat environment.

Infantry School Weight:
128 lbs (130.8 lbs)*
(48 lbs + 68 lbs fighting load + 12 lbs uniform)

Soldier Vote Weight:
114.7 lbs
(42.7 lbs + 60 lbs fighting load + 12 lbs uniform)

Difference:
-13.3 lbs

*Infantry School modified load weight estimates after Focus Groups were conducted

Defining Fitness Constructs

Muscular Endurance	High repetition, long duration, low intensity muscular work (e.g., loading sand bags)
Aerobic Endurance	High repetition, long duration, low intensity cardio-respiratory work (e.g., ruck march)
Muscular Strength	Low repetition, short duration, high intensity muscular work (e.g., lift/push heavy load)
Anaerobic Power	Short duration, high intensity muscular work (e.g., load carry/evac, sled pull/push)
Speed	Short duration, high intensity muscular work (e.g., sprint)
Agility	Short to moderate duration movements requiring rapid 90-180° change of direction (e.g., 30m sprint from cover to cover)
Coordination	Combining fluid movements of the arms and legs to accomplish movement skills while the body is in motion
Flexibility	Range of motion at a joint or joints (e.g., bending and reaching)
Dynamic Balance	Posture, stability and balance while moving under load (e.g., walk, run, jump, lift, carry)
Balance	Posture, stability and balance while stationary (e.g., bend and reach)

APPENDIX P

Protocol Request for Fort Carson Field Study
September 2013

Public Health Report No. 12-01-0614

-----Original Message-----

From: Hoedebecke, Edward L CIV (US)
Sent: Thursday, September 12, 2013 8:44 AM
To: Jones, Bruce H CIV USARMY MEDCOM PHC (US); DeGroot, David W MAJ USARMY MEDCOM PHC (US)
Cc: Eslinger, Dawn M CIV USARMY MEDCOM PHC (US)
Subject: FW: Request for Review: Baseline Soldier Physical Fitness Study (Protocol Development Phase (UNCLASSIFIED)

Classification: UNCLASSIFIED

Caveats: NONE

Bruce, Dave,

Nancy Hathaway has reviewed the documents and determined the activity is not research. What I what you to do is review the documents and agree that that is what you are actually doing. If so, we have the answer and can proceed, if not, we have to talk.

Ned

Edward (Ned) Hoedebecke, DVM, MPH, MA, Dipl ACVPM
Chair, Public Health Review Board
Human Protections Administrator
United States Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5043

-----Original Message-----

From: Hathaway, Nancy L CIV USARMY HQDA OTSG (US)
Sent: Thursday, September 12, 2013 8:41 AM
To: Muraca, Stephanie T CIV (US); Hoedebecke, Edward L CIV (US); Eslinger, Dawn M CIV USARMY MEDCOM PHC (US)
Cc: Myers, Cynthia M CIV USARMY TRADOC (US); Cable, Sonya J COL USARMY (US); East, Whitfield B Dr CIV USA USMA; Whitfield East; Bienvenu, Robert V II CIV USARMY HQDA OTSG (US)
Subject: Request for Review: Baseline Soldier Physical Fitness Study (Protocol Development Phase (UNCLASSIFIED)

Classification: UNCLASSIFIED

Caveats: NONE

AHRPO has reviewed the attached documents and determined, based upon the information provided, that the activity does not meet the definition of "research" as defined by 32 CFR 219.

While there is some systematic inquiry (observing individuals perform specific physical tasks and collecting their MOS, height/weight, last PT score, and opinions about the relevance of the tasks), there is no systematic evaluation that could contribute to generalizable knowledge. Rather, the intent of the activity is identify the operational relevance and feasibility of 5 task scenarios. This background information would then be considered in the development of measures for future research activities.

Please note that the data collected from this activity may NOT be used for research purposes.

To the extent that activities fall outside of those specifically described on the attached request, this determination does not apply.

Nancy L. Hathaway, JD, CIP
Acting Deputy Director
Research Ethics and Compliance Officer

Public Health Report No. 12-01-0614

Army Human Research Protections Office
7700 Arlington Blvd, Ste 3SW319
Falls Church, VA 22042-5143
AHRPO Office: 703-681-6565
AHRPO email usarmy.ncr.hqda-otsg.mbx.usarmy-ncr-hqda-otsg-mailbox-otsg--ahrp@mail.mil

-----Original Message-----

From: Muraca, Stephanie T CIV (US)
Sent: Wednesday, September 11, 2013 11:09 AM
To: Hathaway, Nancy L CIV USARMY HQDA OTSG (US)
Cc: Myers, Cynthia M CIV USARMY TRADOC (US); Cable, Sonya J COL USARMY (US);
East, Whitfield B Dr CIV USA USMA; Whitfield East
Subject: Request for Review: Baseline Soldier Physical Fitness Study
(Protocol Development Phase) (UNCLASSIFIED)
Classification: UNCLASSIFIED
Caveats: NONE

Ma'am:

Thank you, very much, for your time and patience regarding this issue. I hope this helps put things in order, but if not, please don't hesitate to contact me at this email address, or via cell [xxxxx].

The attached submission details an "information-gathering" effort to garner the insights and feedback we need to refine potential criterion measures. We are in the process of developing our research protocol, but before we can complete and submit it to AHRPO for consideration, we need to assess the feasibility and operational relevance of a series of Warrior Task and Battle Drill (WTBD) scenarios (our potential criterion measures). WTBDs are common Army tasks on which all Soldiers, regardless of age, gender, or occupational specialty, are required to maintain proficiency. WTBDs are taught in Initial Entry Training, and are consistently trained/reinforced throughout the Army career-cycle.

A team of subject matter experts (SMEs) developed a series of WTBD scenarios that we hope to use as criterion measures in future research efforts. Before we can propose those efforts, or even assess the WTBD scenarios for reliability, we must determine if the scenarios are feasible (given time/space/resource constraints, can they actually be constructed and managed?) and operationally relevant (do experienced Soldiers think the scenarios contain movements actually performed in combat environments?). That is what we hope to glean from this information gathering effort – the insight we need to refine (or scrap) the scenarios so that we can develop a research protocol. This is part of a larger study effort to improve Army Physical Fitness training and assessment by forging a stronger link between the former and the physical demands placed upon Soldiers in combat/hostile environments.

V/r,
Stephanie

Stephanie T. Muraca, Ph.D.
Research Psychologist
IMT-CoE
ATTN: ATCG-MTA
210 Dillon Circle
Fort Eustis, VA 23604-5701

**Initial Military Training Center of Excellence (IMTCoE)
Institutional Review Board
Protocol for Human Subjects Research**

For Office of Human Protections Use Only:
 Protocol Number: _____
 Protocol Title: _____
 Version: _____
 Date Received: _____

- Download this document to your computer prior to entering your information.
- To enter your information, double-click on shaded boxes. This instruction applies to both text and check boxes.

1. Principal Investigator Information

First Name: Whitfield	Middle Initial: B.	Last Name: East
Degree(s): EDD – Measurement, Evaluation, & Statistics		
IMTCoE Human Subjects Training Completed?		Email:
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Job Title: Professor		Affiliation: <input type="checkbox"/> Student <input checked="" type="checkbox"/> DoD Employee <input type="checkbox"/> Military <input type="checkbox"/> Contractor <input type="checkbox"/> Other, specify:
Department/Division: Physical Education		School/College: United States Military Academy
Company:		Contractor:
Work Phone:		
Fax:		

2. Supervisor Information (Faculty Advisor if PI is a student,) NA

Supervisor Name: COL Sonya Cable	Title: Director, HDD/IMT-CoE
Human Subjects Training Completed?	
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Department: IMT-CoE	School/University:
Division: HDD/R&AD	Contractor:
Work Address:	Zip+4:
Cell Phone:	

3. Study Contact Information (complete if primary contact is different from PI) NA

First Name:	Middle Initial:	Last Name:
Degree(s):		
IMTCoE Human Subjects Training Completed? <input type="checkbox"/> Yes		Email:
<input type="checkbox"/> No		
Job Title:		Affiliation: <input type="checkbox"/> Student <input type="checkbox"/> DoD Employee <input type="checkbox"/> Military <input type="checkbox"/> Contractor <input type="checkbox"/> Other, specify:
Department:		School/University:
Division:		Contractor:
Work Address:		Zip+4:

Public Health Report No. 12-01-0614

Work Phone:	Fax:	Pager:	Cell Phone:
-------------	------	--------	-------------

4. Additional Personnel Involved in Study (insert additional rows if needed)

Note: Research personnel include all individuals under IMTCoE IRB jurisdiction responsible for recruitment, consent or data collection.

Name (First, Middle, Last)/Degree	Department/Division or Affiliation	Role In Project	IMT CoE Human Subjects Training Completed	Date Training Complete
Stephanie T. Muraca, Ph.D.	HDD / IMT-CoE	Co-Investigator	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	08/2011
	/		<input type="checkbox"/> Yes <input type="checkbox"/> No	
	/		<input type="checkbox"/> Yes <input type="checkbox"/> No	
	/		<input type="checkbox"/> Yes <input type="checkbox"/> No	

5. Study Type Information

A. Review Requested:

Full Committee -- Study does not meet Exemption or Expedited Review Requirements

Expedited -- Study meets Expedited Review (Research deemed no more than minimal risk AND the only involvement of human subjects is in one or more Federally specified categories.) See [Expedited Categories](#).

Exempt

B. Has this proposal been previously reviewed by an IMTCoE IRB?

No
 Yes

If "Yes," please list IRB #(s):

6. Study Abstract

In 250 words or less, provide a brief abstract of the study in lay language.

***PLEASE NOTE: The purpose of this effort is to gather the *preliminary information* necessary to develop criterion measures for potential future studies of the extent to which field-expedient physical fitness tests (e.g., push-ups, bench-press, sprint) predict Warrior Task and Battle Drill (WTBD) performance. WTBDs are the Army's "common core" of movements and tactics that all Soldiers, regardless of age, gender, or military occupational specialty, must be able to perform. This effort will provide the insight necessary to develop two research protocols: The first protocol, which will be submitted to AHRPO o/a December 2013, will request approval to assess the reliability (inter-rater and test/re-test) of the yet-to-be-determined criterion measures (WTBD scenarios). The second protocol, which will be submitted to AHRPO in FY2014, will request approval to assess the extent to which different field-expedient physical fitness tests (e.g., push-ups, bench press, sprint) predict performance on the WTBD scenarios.

Before the research protocols can be developed, team members must determine the feasibility of constructing/resourcing the WTBD scenarios, the number of personnel necessary to manage the "obstacle courses," and the extent to which the proposed WTBD scenarios reflect operations in combat/hostile environments. Based on feedback from volunteer observers and/or participants, team members will adjust the WTBD scenarios, and design the final criterion measures.

Team members will be assessing the feasibility/operational relevance of five discrete WTBD performance scenarios developed by Subject Matter Experts (SMEs) to reflect tasks commonly performed by baseline

(entry-level) Soldiers in operational environments. Contributing SMEs included academicians and practitioners in the fields of medicine, human performance, and exercise physiology, Army training developers and instructors, and incumbent Soldiers (Officers and Enlisted, senior and junior, across a range of occupational specialties).

The IMT-CoE team will construct five obstacle-type courses (designed to simulate a tactical march, offensive/defensive movement in a hostile situation, casualty extraction and evacuation, sandbag filling, carrying, and stacking, and combatives), and modify courses on-site to accommodate space, time, and resource constraints. The team will observe volunteers as they execute these tasks, and gather feedback about task relevance, realism, and physical demand.

This proposed observational/protocol development phase is part of a larger study effort to improve Army Physical Fitness training and assessment by forging a stronger link between the former and the physical demands placed upon Soldiers in combat/hostile environments. By observing Soldiers as they execute common task scenarios, study team members will gain a better understanding of the discrete physical movements and physiological processes involved in tactical activities. By assessing the operational relevance and feasibility of the five task scenarios, team members will gather the information they need to develop task-based criterion measures against which to validate potential field expedient test items.

7. Background Information

Describe the background information, specific aims, hypothesis or research question, previous experience, and a critical evaluation of existing knowledge (relevant literature) about the research topic. A reference list and copies of pertinent articles can be appended if thought to be of value in the evaluation of the research by the IRB. The IRB needs to understand how this study adds to the knowledge on this topic in order to be able to judge the risks and benefits to the research participants.

The contributions of physical readiness to combat performance are not in disputable. High levels of physical conditioning provide Soldiers with three significant performance advantages: (1) an increased high and low intensity work capacity, resulting in increased functional fitness, (2) an increased mental toughness and perseverance (will to win), and (3) a decreased risk of injury, resulting in increased survivability due to all-cause morbidity and combat-related injuries. Terms, like "pentathlete" and "Soldier athlete", are common place in Army parlance and Army training manuals laud the benefits of high levels of physical conditioning. In addition we clearly know "what right looks like" relative to periodized training and yet the US Army has never clearly define and operationalize the physiological needs of the modern combat Soldier. This physiological tableau must be scientifically based and sufficiently broad to prepare Soldiers for full spectrum combat operations in varying terrains and climates. Once the Army establishes the requisite physiological needs for combat, it can then develop applicable training programs and criterion-referenced assessments and standards to measure physical readiness and ensure success of our combat mission.¹ These performance assessments and concomitant standards can then serve as the determinant of combat readiness.

"Every war in which the US has been involved since 1860 has revealed the physical deficiencies of our soldiers during the initial mobilization...casualties in initial engagements were attributed to the inability of our soldiers to physically withstand the rigors of combat..."

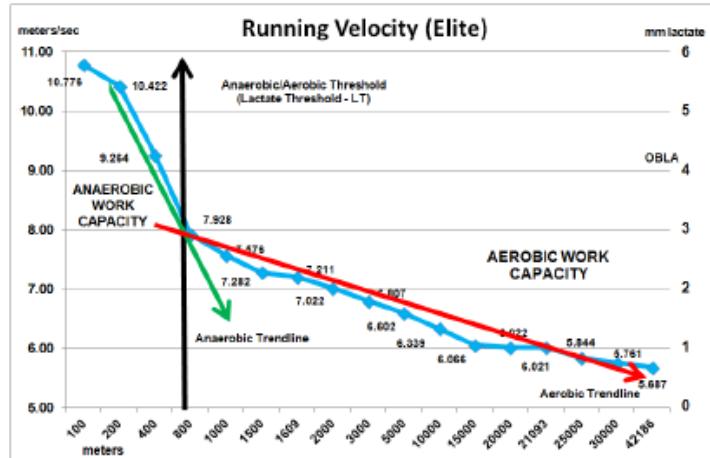
To sharpen our focus on how we think about physical readiness training and assessment in the Army, we can address five embedded issues. Although the U.S. Army Physical Fitness School, the 75th Ranger Regiment (Ranger Athlete Warrior) and to a lesser degree the 101st Airborne Division (Eagle Tactical Warrior Program) and the 4th Infantry Division (Mountain Warrior Program) have made some progress in PRT development over the past six years, the Army has yet to empirically define the baseline physiological needs of the Soldier. We have a myriad of first-person anecdotal reports from Soldiers, commanders, and fitness professionals that describe the physical nature of combat, but we have no

empirical evidence. The closest we came was in 1942-43 when Drs. Esslinger and McCoy worked with COL Ted Bank to develop a “combat focused” PRT program and then tested their program against known measures of endurance, stamina, and coordination and against existing Army PRT programs. These results provided the foundation for TC 87 – *Physical Training* (1942) and DA Pam 21-9 – *Physical Conditioning* (1944).

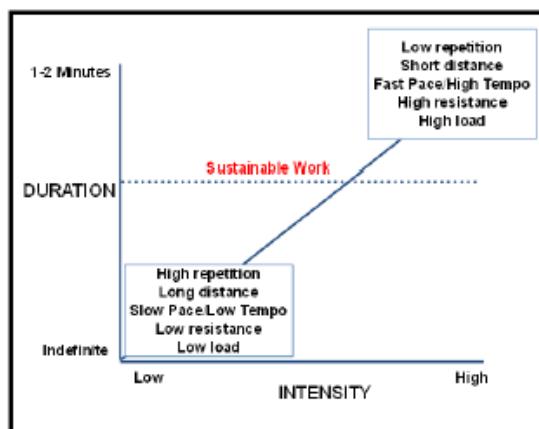
With regard to the physical domain current Warrior Tasks and Battle Drills require significant levels of strength, stamina, and mobility.ⁱⁱⁱ Regardless of a Soldier’s military occupational specialty there is a common set of physically demanding, commonly occurring Warrior Tasks and Battle Drills^{iv} and Common Soldier Tasks^v that every Soldier must perform. Successful performance of these functional tasks is predicated upon a Soldier’s general physical fitness, which is composed of three areas: structural work capacity, metabolic work capacity, and physical work economy.^{vi} Structural work capacity is the ability to develop and maintain an adequate structural integrity to promote dynamic postural equilibrium and serve as a platform for load carriage. Metabolic work capacity is the ability to generate adequate energy to fuel task performance. Physical work economy is the ability to perform repetitive movement tasks at the lowest metabolic cost. After a short discussion of each of these areas of physical fitness, we will discuss how these areas inform physical readiness training.

Structural work capacity is developed during the general preparation phase (GPP) of fitness development.^{vii} In the GPP phase Soldiers work to repair the body from previous physical activity or prepare the body for future physical activity. Physical training should concentrate on light to moderate impact activities to initiate adaptive bone remodeling, refine CNS recruitment of muscle fibers, and soft tissue integrity. Soldiers should concentrate on higher repetition, low load exercises with great attention to body mechanics/posture and precision of movement. After 8-12 weeks these adaptive physical activities prepare the skeletal and soft tissue structures for more vigorous physical activity and load carriage.^{viii} The progression curve should be relatively flat as Soldiers work to strengthen the frame and core. An ancillary consideration of this phase is awareness of and attention to body mass, more specifically the absolute amount of fat mass and the ratio of lean to fat mass. Lean mass is metabolically more active and contributes to movement efficiency and effectiveness.

Developing metabolic work capacity primarily occurs in the build (toughening) phase of physical readiness training. Humans are carbon-based aerobes; we are inextricably linked to the production of high quantities of Adenosine Triphosphate (ATP). As Soldiers execute the repetitive movements required in WTBD/CSTs the demand for ATP exceeds what can be supplied via glycolysis and aerobic metabolism supplies the bulk of ATP via oxidative phosphorylation of pyruvate (carbohydrate) and triglyceride (fat). Large quantities of ATP are created via the electron transport chain, which requires a continuous supply of oxygen. Through O₂ respiration and transportation to the muscles via hemoglobin, the mitochondria can produce large quantities of ATP. We often measure aerobic work capacity as the maximal level of O₂ uptake and is reported in milliliters of O₂ per kilogram of body weight per minute (mL/kg/min) and call this measure predicted VO₂ max. With a continuous supply of O₂ the rate limiter in ATP production for repetitive movements is glucose, which is derived from carbohydrate metabolism. For higher intensity steady-state repetitive movements humans have enough glucose (stored glycogen) to produce requisite levels of ATP for about 2 hours (enough to generate about 2,000 kcals of energy).^{ix}



This framework of Army physical readiness training and assessment must be built around the concept of physical work capacity (PWC); i.e., the ability to perform physical work in a functional environment. The standard metric of physical work capacity is work volume, which is defined as the product of work intensity and work duration. Work intensity is a function of resistance (speed) x repetitions (distance) ± rest, which controls work duration. Training frequency (how often we train) is predicated on the status of the Soldier and the training volume (how long/hard we train – duration x intensity). These components must be strictly coordinated with training recovery (i.e., the time required for a Soldier to rest between work bouts). Training recovery is in turn regulated by two factors: the physiologic characteristics of the individual Soldier and their current physiologic status. Failure to understand the rate at which a Soldier recovers and his/her current physiologic status and to incorporate that knowledge into the development and execution a periodized training plan will ultimately lead to organic failures. To produce Soldiers who are capable of accomplishing WTBD/CSTs physiologic training must occur throughout the entire intensity spectrum with accommodations for proper rest/recovery. This PRT framework is perhaps easier to visualize graphically:



Physical Work Capacity Continuum^x

Physical work capacity is primarily influenced by the quantity and efficiency of lean muscle mass and the ratio to total body mass. Musculoskeletal fitness begins to influence work capacity as work load and work duration increases. Lifting heavy objects for long durations requires muscles to generate a greater amount of force, which imparts a greater metabolic demand and eventually leads to muscular fatigue. Muscular fatigue will result from peripheral fatigue (due to depletion of intramuscular energy stores) and central fatigue (impaired brain and nervous system function due to glycogen depletion), which decreases the muscle's ability to generate force resulting in a decrease in performance and work capacity.^{xii} During physical training exposure to progressive work overload causes "type II fibers take on many of the properties of type I fibers, with reduced myosin ATPase activity, increased mitochondrial density and oxidative enzyme activities, and a greater capillary density."^{xiii}

There are many manifestations of a dysfunctional periodized training plan. In some cases Soldiers fail to develop adequate baseline levels of physical fitness. In other cases the lack of specificity results in a failure to acquire appropriate levels of functional fitness. However, one of the most revealing symptoms of a dysfunctional PRT plan is a high number of organic failures (injuries), which seems to be the case in the Army.^{xiv} For CY2004 Ruscio et al. estimated that Service members (DoD-wide) had over 2 million injury visits for acute and chronic (overuse) injuries affecting approximately 900,000 Service members at a cost of hundreds of millions of dollars and resulting in over 25,000,000 days of limited duty.^{xv} In 2006 the Department of Defense recorded an estimated 743,547 musculoskeletal injuries at a cost of over \$2.2 billion.^{xvi}

For the Army to regain the momentum in PRT there is a need to resource a modern, comprehensive combat-focused fitness research program that will drive physical readiness training and assessment. We have but to compare the secular advances in the science of exercise and human performance over the past 30 years with current Army PRT doctrine to understand the gross disparity. Here are four basic research questions that demonstrate the depth of our lack of understanding: (1) what are the baseline physical attributes that constitute combat readiness; (2) what are the frequency, duration, and intensity of training required to illicit these physical attributes, (3) what fitness measures best assess these physical attributes; and (4) what resources (trainers, facilities, and equipment) are required to facilitate acquisition of these physical attributes in a timely manner while mitigating organic failures. We currently cannot answer even these basic questions to any degree of scientific acceptability. Only PRT doctrine grounded in the science of exercise and human performance can prepare Soldiers, leaders, and units to fight in the full spectrum of operations.

The most precious and irreplaceable resource in the U.S. Army is the individual Soldier. We must do all we can to develop and preserve this resource. Since the early 1900's the Army's physical readiness training program has been universally recognized as a force multiplier that enhances combat effectiveness, resilience, and survivability on the battlefield. We spend billions of dollars each year developing and producing tactical weapons and funding the associated training necessary to deploy them. Although we have the most technologically advanced Army in the world, our commitment to physical readiness training is derisory by comparison. As the Army moves to a smaller, lighter, more mobile force in the fight against the global war on terrorism, a long-term, comprehensive commitment to the highest quality physical readiness training is mandatory to ensure our future success.

¹ Note: a relevant example of how similar organizations accomplish this goal is the Houston, TX Fire Department. The Houston Fire Department uses a job-related physical ability test designed to determine if an applicant has the requisite strength and endurance needed to perform the job duties of a Firefighter. These job duties require balance, coordination, strength, endurance, and cardio-vascular fitness. Applicants are tested over seven (7) timed, pass/fail events while wearing

gloves and an air pack because Firefighters are required to wear Self-Contained Breathing Apparatus (SCBA) and other heavy protective clothing while functioning at emergency incidents. The events include:

- Balance Beam Walk- within 30 seconds, one must walk the entire length of the beam.
- Ladder Extension - within 1 minute, an applicant must fully extend and lower the fly section of a 24' aluminum extension ladder by using the hand-over-hand method.
- Stair Climb - within 3 minutes 30 seconds, an applicant must pick up, shoulder hold, and carry two (2) 50' sections of hose, tied in a "Brown Fold," then climb and descend six (6) flights of stairs.
- Equipment Hoist - within 1 minute, an applicant standing on the 3rd floor of the drill tower, using the hand-over-hand method, must hoist one section of 2 ½" hose (44 lb.) from the ground up to the 3rd floor window, and then lower the hose back to the ground.
- Portable Equipment Carry - within 1 minute, an applicant must pick up an equipment/accessory box (Hurst, or Amkus, extrication tools) (70 lb.) from a 2' stand and carry it 50' in one direction, turn around to carry it back 50' and then place the box on a 3' stand.
- Rescue Attempt - within 30 seconds, an applicant must carry or drag a 150 lb. human dummy, 30 feet.
- 1.5 Mile Run - within 13 minutes 7 seconds, an applicant must run 1.5 miles.

² Department of the Army, *Physical Readiness Training - FM 21-20* (Washington, D.C.: U.S. Government Printing Office, 1980), 1-2.

³ FM 7-22 – “Army Physical Readiness Training”, Department of the Army, October, 2012.

⁴ Warrior Tasks and Battle Drills, IMTCoE, March 2013.

⁵ Soldier’s Manual of Common Tasks, IMTCoE, 2013.

⁶ TRADOC PAM 257-3-7: *The Army Human Dimension Concept*, Department of the Army, 2013; Sharon L. Plowman and Denise L. Smith. *Exercise Physiology for Health, Fitness, and Exercise*. Baltimore: Lippincott, Williams and Wilkins, 2008; Tudor W. Bompa. *Periodization Training: Theory & Methodology of Training*. Champaign, Ill: Human Kinetics, 1999.

⁷ Personal conversation with Dr. William Brechue, FACSM (9 July 2013).

⁸ Belinda R. Beck, “Stress Fractures,” *ACSM Current Comment* (Indianapolis, IN: American College of Sports Medicine, , 2007), 1 – available at: <http://www.acsm.org> (accessed 3 May 2011); Note: based upon the American College of Sports Medicine “Current Comment” on stress fractures, we know it take about six weeks of adaptive exercise before bone density and connective tissue improve enough to help prevent stress-reaction injuries; “Bones are most susceptible to stress fracture when weakened by remodeling-related porosity, a primary stage in the adaptive response of bone to changes in patterns of loading.” (p. 2)

⁹ Andrew M. Jones, “The Physiology of the World Record Holder for the Women’s Marathon” *International Journal of Sport Science & Coaching* 1:2 (2006): 101-116; Scott Powers and Edward Howley, *Exercise Physiology: Application to Theory and Performance*. Columbus, OH: McGraw Hill Publishing Co, 2013.

¹⁰ Whitfield B. East, *A Historical Analysis of Army Physical Readiness Training and Assessment*, FT Leavenworth, KS: Combined Arms Institute Press, US Army Combined Arms Center, March 2013.

¹¹ Paul J. Sharkey and Brian O. Davis. *Hard Work: Defining Physical Work Performance Requirements*. Champaign, Ill: Human Kinetics, 2008; Per-Olof Astrand, Kaare Rodahl; Hans A. Dahl and Sigmund B. Stromme. *Textbook of Work Physiology*. Champaign, Ill: Human Kinetics, 2003.

¹² Jones, “Physiology of the World Record Holder”, 112.

¹³ Note: based upon the April 2009 *Armed Forces Medical Surveillance Monthly Report*, there were 7.8 million ambulatory visits for illness and injury during 2008; the largest percentage (> 24%) of visits were caused by musculoskeletal and connective tissue injuries – generally construed to be “overuse” injuries (approximately 1.9 million visits); Larkin, 2010, p. 41-42.

¹⁴ Bruce Ruscio, et al., *DOD Military Injury Prevention Priorities Working Group: Leading Injuries, Causes and Mitigation Recommendations* (Washington, DC: Office of the Assistant Secretary of Defense for Health Affairs, February 2006), 1, 4, 7; *Preventing Injuries in the U.S. Military: The Process, Priorities, and Epidemiologic Evidence* (Aberdeen Proving Ground, MD: Army Center for Health Promotion and Preventive Medicine, December 2008), Section 1-1, A(2), 1-2.

¹⁵ Christopher P. Larkin, “Combat Fitness a Concept Vital to National Security” (Paper - Master of Science, Department of Defense: Joint Forces Staff College, 18 June 2010), 100; Note: MAJ Larkin extrapolated these data, which were derived from the following source: Armed Forces Health Surveillance Center. “Ambulatory Visits among Members of Active Components, U.S. Armed Forces, 2008,” *Medical Surveillance Monthly Report* 16:4 (April, 2009): 10.

8. Location of Research

A. Is this a multi-center research project in which IMTCoE will function as the coordinating center/lead institution? (A multi-center study is one where different PIs at different institutions are conducting the same study.)

No

Yes

Note: If "Yes," please indicate the total number of participants to be consented at ALL sites, including military installations, in item 8B.

B. List all Performance Sites "engaged in research" (insert additional rows if needed).

An institution or performance site is "engaged in research" when its employees or agents (i) intervene or interact with living individuals for research purposes; (ii) obtain individually identifiable private information for research purposes; or (iii) if the institution receives a direct federal award to support such research. Please refer to the instructions for examples of what may be considered "engaged in research." *This may apply when an IMTCoE investigator collaborates with a non-IMTCoE investigator or institution, or when IMTCoE serves as a Coordinating Center. Please check all that apply and add additional sites. Each will require a letter of IRB approval. See IMTCoE Policy for Waiver of Informed Consent.*

Check all that apply	Name of Performance Site (list all participating sites below)	FWA Holding Institution	IRB of Record	IRB Approval
<input checked="" type="checkbox"/>	FT Carson, CO		<input type="checkbox"/> IMTCoE <input checked="" type="checkbox"/> Other	<input type="checkbox"/> Attached <input type="checkbox"/> Pending
<input type="checkbox"/>			<input type="checkbox"/> IMTCoE <input type="checkbox"/> Other	<input type="checkbox"/> Attached <input type="checkbox"/> Pending
<input type="checkbox"/>	Other, specify:		<input type="checkbox"/> IMTCoE <input type="checkbox"/> Other	<input type="checkbox"/> Attached <input type="checkbox"/> Pending
<input type="checkbox"/>			<input type="checkbox"/> IMTCoE <input type="checkbox"/> Other	<input type="checkbox"/> Attached <input type="checkbox"/> Pending
<input type="checkbox"/>			<input type="checkbox"/> IMTCoE <input type="checkbox"/> Other	<input type="checkbox"/> Attached <input type="checkbox"/> Pending

C. List all Performance Site(s) "not engaged in research" (insert additional rows if needed).

NA

An institution or performance site is considered "not engaged in research" when its employees or agents do not (i) intervene or interact with living individuals for research purposes; or (ii) does not obtain individually identifiable private information for research purposes; or (iii) if the institution does not receive a direct federal award to support such research. *This applies if an IMTCoE investigator will be conducting research at a non-IMTCoE site or institution (e.g., when collecting data).* Please refer to the instructions for examples of what may be considered "not engaged in research." *See IMTCoE Policy for Waiver of Informed Consent.*

Name of Performance Site	If the Performance Site has an IRB, a copy of the IRB approval letter is required.	If the Performance Site does not have an IRB, a letter of cooperation is required.
	<input type="checkbox"/> Attached <input type="checkbox"/> Pending	<input type="checkbox"/> Attached <input type="checkbox"/> Pending
	<input type="checkbox"/> Attached <input type="checkbox"/> Pending	<input type="checkbox"/> Attached <input type="checkbox"/> Pending
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	<input type="checkbox"/> Attached <input type="checkbox"/> Pending	<input type="checkbox"/> Attached <input type="checkbox"/> Pending

9. Subject Population(s)

A. Identify all categories or groups, primary or secondary target, age range, total number to be solicited, total number to be consented, and the number expected to complete the study. Primary targets are those who either give consent or those who can only provide assent (e.g., minors). Secondary targets are those who provide data to supplement the primary target data (e.g., parents completing a questionnaire, teachers who supply information and data).

Category/Group (e.g., parents, children, teachers, adults)	Primary or Secondary Target	Age Range (e.g., 7-12, 13-17, adults)	Number Directly Solicited (applies only to mailed survey studies)	Number to be Consented (including withdrawals or screen failures)	Number Expected to Complete the Study
4 th Infantry Division	<input checked="" type="checkbox"/> Primary <input type="checkbox"/> Secondary	adults	<input checked="" type="checkbox"/> N/A	300	200
	<input type="checkbox"/> Primary <input type="checkbox"/> Secondary		<input type="checkbox"/> N/A		
	<input type="checkbox"/> Primary <input type="checkbox"/> Secondary		<input type="checkbox"/> N/A		
	<input type="checkbox"/> Primary <input type="checkbox"/> Secondary		<input type="checkbox"/> N/A		

Insert additional rows if needed.

TOTALS Enter totals from columns 4, 5, & 6	<input type="checkbox"/> N/A	300	200
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B. For multi-center research projects, please provide the total number of participants to be consented at ALL sites. (See item 8B.)

Not Applicable

C. Describe how the selection of participants is equitable in relation to the research purpose and setting (e.g., *no one ethnic group is targeted or excluded, the same group of participants will benefit from the results of the research*).

4th Infantry Division Commanders will identify Soldiers who are: (1) physically fit (passed their most recent Army Physical Fitness Test); (2) physically well (e.g., not injured, not on an Army "profile," not recently diagnosed with a performance-inhibiting illness or disease, not pregnant); (3) who are at least one year post-completion of Army Initial Entry Training; (4) who have had sufficient time to acclimate to Fort Carson's altitude; and (5) who are available to attend an information briefing conducted by IMT-CoE personnel (e.g., Soldiers not on leave, pass, or with conflicting duty assignments). IMT-CoE personnel will provide a general description of the Army's effort to study and potentially change physical fitness testing, and a very detailed description/walk-through demonstration of the WTBD scenarios (potential criterion measures). IMT-CoE personnel will also conduct a safety briefing. Upon conclusion of the briefing, 4th ID Soldiers will be invited to complete the WTBD "obstacle course," parts of the course if they would prefer not to complete it in its entirety, or to observe as others complete the course, and then to provide feedback about the operational relevance/realism of course components, and about modifications that can be made to course construction/execution. Volunteers will not be screened in or out on the basis of gender, ethnicity, education, or any other sociodemographic variable.

10. Does this study target one gender or specific social/ethnic group(s)?

No Yes *If "Yes," please provide a rationale.*

11. Is the population being enrolled in this study at high risk for incarceration?

No

Yes *If "Yes," will the participants be withdrawn from the study once they are incarcerated?*

No

Yes

If "No," describe how recontacting/reconsenting, treatment, and/or follow-up will occur.

12. How will non-English speaking participants be consented? *Not Applicable at this time
(Federal regulations require the equitable selection of minorities as research subjects to assure that they receive an equal share of the benefits of research and to ensure that they do not bear a disproportionate burden.)

A. Choose one:

- A translated written informed consent document in a language understandable to the participant. This should be an accurate translation of the full informed consent document (*consider having a translator present during the consenting process should the participant have any questions*).
- Orally, using a qualified translator to translate the English informed consent document to the participant, and a translated short form in a language understandable to the participant (*See IRB Policy IV.B "Documentation of Informed Consent" for details*).

**Note: It is acceptable to submit the English informed consent document and the English short form, if there is no current non-English speaking person identified for the study. Once identified, the translated informed consent document or the short form must be submitted to the IRB for expedited review and approval prior to consenting the participant.*

B. Identify the name of the individual or translation service that provided the translation.

C. List the qualifications of the individual who provided the translation.

13. Will a waiver or alteration of the consent process or a waiver or alteration of the consent documentation be used?

No

Yes *If "Yes," complete the [Request for Waiver of Consent and/or Authorization](#).*

14. Participant Identification, Inclusion/Exclusion Criteria, and Recruitment

A. Describe the specific steps to be used to identify and/or contact prospective participants. (If applicable, also describe how you have access to lists of potential participants. Scripts and advertisements should be submitted with this application or examples should be provided for any telephone contacts, advertisements, oral contact, etc.)

^{4th} Infantry Division Commanders will identify Soldiers who are: (1) physically fit (passed their most recent Army Physical Fitness Test); (2) physically well (e.g., not injured, not on an Army "profile," not recently diagnosed with a performance-inhibiting illness or disease, not pregnant); (3) who are at least one

year post-completion of Army Initial Entry Training; (4) who have had sufficient time to acclimatize to Fort Carson's altitude; and (5) who are available to attend an information briefing conducted by IMT-CoE personnel (e.g., Soldiers not on leave, pass, or with conflicting duty assignments). IMT-CoE personnel will provide a general description of the Army's effort to study and potentially change physical fitness testing, and a very detailed description/walk-through demonstration of the WTBD scenarios (potential criterion measures). IMT-CoE personnel will also conduct a safety briefing. Upon conclusion of the briefing, 4th ID Soldiers will be invited to complete the WTBD "obstacle course," parts of the course if they would prefer not to complete it in its entirety, or to observe as others complete the course, and then to provide feedback about the operational relevance/realism of course components, and about modifications that can be made to course construction/execution. Volunteers will not be screened in or out on the basis of gender, ethnicity, education, or any other sociodemographic variable.

B. Describe the specific steps for obtaining informed consent (e.g., by whom, his/her credentials, where, when, etc.).

Civilian IMT-CoE personnel (Mr. Michael Haith, Dr. Whitfield East) will provide the informed consent briefing to 4th Infantry Division Soldiers. The briefing will explain the purpose of the effort and what participants will be asked to do. The informed consent briefer will emphasize that participation is completely anonymous (PII will NOT be collected from volunteer participants) and voluntary, that a volunteer can stop participating at any time/refuse to answer questions, and that there will be no penalties/consequences for not participating/not answering questions. The briefer will also emphasize that complete anonymity will be guaranteed at all times throughout the effort, and that volunteers should not write their name or any other PII on feedback documents or materials. Following the brief, Soldiers will have the opportunity to ask questions, and will be told that they can ask questions at any time throughout the effort. They will also be provided with study team contact information should any questions or concerns arise upon completion of the WTBD scenarios. Soldiers who chose to participate will not be asked to sign any forms in order to maintain complete anonymity of participants.

C. Does the person obtaining consent have an existing relationship with the participant?

No
 Yes

If "Yes," describe the relationship and how you will protect against undue influence or coercion.

D. Identify the criteria for inclusion and exclusion and explain the procedures that will be used to determine eligibility. If psychiatric/psychological assessments will be conducted (e.g., depression or suicidal ideation screenings), state who will administer, his/her experience, and how risks will be managed.

No Soldiers who volunteer to participate will be excluded from the study.

E. Do you plan to actively recruit participants?

NOTE: Please provide a copy of all advertising materials including ads, letters and telephone scripts with this application; must include graphics. In addition, The IRB must review and approve final copies of all audio/videotapes prior to use.

No
 Yes

If "Yes," choose all recruitment/advertisement methods that apply:

<input type="checkbox"/> Flyers	<input type="checkbox"/> Mass E-mail Sollicitation	<input type="checkbox"/> Radio
<input type="checkbox"/> Internet	<input type="checkbox"/> Newspaper	<input type="checkbox"/> Telephone
<input type="checkbox"/> Letter	<input type="checkbox"/> Posters	<input type="checkbox"/> Television
<input type="checkbox"/> Departmental Research Boards	<input type="checkbox"/> Other (describe):	

F. Do you agree to release study information to IMTCoE-approved web sites or publications? Posting research information on research-related websites allows potential participants to search and find studies related to their condition or interest. *(Please be aware that if this research is subject to a contractual agreement, it may be necessary for you to obtain permission from the sponsor prior to authorizing the release of any study information.)*

No, do not release information to research-related web sites.
 Yes, this information may be released as described in item #1 of the informed consent document (Purpose of the study).

15. Methods and Procedures Applied to Human Participants (Where appropriate, check all that apply)

A. Please provide a chronological narrative of ALL study procedures. *(For use of multiple assessments, questionnaires, etc., it is suggested that a table is included showing the frequency and duration of each of the study related activities.)*

***Please Note: This effort will be conducted over the course of two weeks. Weeks one and two will follow the same order of events (described below), but with different groups of volunteer participants. During week one, 150 volunteer participants from the 4th ID will have the opportunity to execute the WTBD scenarios/provide feedback, and during week two, a separate group of 150 volunteer participants from the 4th ID will have the opportunity to do the same.

1. Command-selected Soldiers assigned to FT Carson's 4th ID will attend an operational concept and informed consent briefing. IMT-CoE team members will explain purpose and procedures, provide a step-by-step description of what study participants will be asked to do, provide an active demonstration of WTBD performance components, and will emphasize principles of informed consent/the voluntary nature of participation/participants' right to opt out at any time without consequence or reprisal.
2. Soldiers who volunteer to participate will receive a safety briefing from a certified Army exercise physiologist (Dr. Whitfield East) about the safe and ergonomically/physiologically correct way to execute the physical task components of the "obstacle course," about proper performance fueling, and about the importance of staying properly hydrated while executing the physical task components. Participants will have the opportunity to ask any questions they may have about proper physical form, nourishment, and hydration, and will be informed that they may ask questions at any time throughout the course of the effort.
3. The criterion development effort will span four days, lasting approximately 3 hours per day.
4. On day one, volunteers will have the opportunity to observe, walk-through, and practice different components of the WTBD "obstacle course."
5. On day two, participants will practice the individual WTBD simulations:
 - a) Move Over/Under/Around Obstacles. Wearing a tactical "load" (approximately 35 lbs including uniform items), Soldiers will complete a 100m obstacle course that requires them to sprint 15m, zigzag run 45m while jumping over two low obstacles (12") and negotiating 8 tires; traverse on a 40' zigzag balance beam under load (beam will be resting on the ground and Soldiers will carry a 40 lb jerry water can in each hand); lift two 30 lb objects onto a 6' platform, climb onto the platform using hand/foot holds, cross the platform, lower themselves and the objects to the ground; surmount a 4.5' wall; complete an over/under obstacles; and sprint 15m. All these obstacles are commonly occurring in Urban Terrain. Soldiers will proceed at their own pace, may stop and rest, may self administer nutrients and water, and may stop the exercise at any time. Soldiers will be allowed to wear a heart-rate monitor (similar to wearing a wristwatch with a chest strap) if they chose to do so. This event will be filmed and Soldiers will be asked about the level of their physical effort at the end of the course.

- b) Dig/lift/carry/fill/stack: Wearing a tactical "load" (approximately 35 lbs including uniform items), Soldiers will complete a dig/fill/carry/stack task that will involve filling 4-gal buckets with sand, carrying 5m and emptying into two 55-gal trashcan (approximately 13 repetitions). When the trashcan is full, Soldiers will lift/carry 16-40lb sandbags (generally one sandbag at a time) 5m and stack 4x4 rows on top of a 36" platform. This task contains common Soldier tasks associated with preparing a fighting position. Soldiers will proceed at their own pace, may stop and rest if necessary, may self administer nutrients and water as needed, and may stop the exercise at any time if necessary. Soldiers will be allowed to wear a heart-rate monitor (similar to wearing a wristwatch with a chest strap) if they chose to do so. This event will be filmed and Soldiers will be asked about the level of their physical effort at the end of the event.
- c) Casualty Extraction and Drag: Wearing a tactical "load" (approximately 35 lbs including uniform items), Soldiers will complete a sprint for 15m and crouch run for 15m to get to the objective – a HUMVEE. Once at the HUMVEE the Soldier will open the driver's side door and extricate a wounded soldier (220 lb training dummy) from the HUMVEE with a controlled lowering to the ground. Once the casualty is on the ground the Soldier will drag the casualty 20m. This task contains a commonly occurring WTBD associated with a casualty evacuation. Soldiers will proceed at their own pace, may stop and rest, may self administer nutrients and water, and may stop the exercise at any time. Soldiers will be allowed to wear a heart-rate monitor (similar to wearing a wristwatch with a chest strap) if they chose to do so. This event will be filmed and Soldiers will be asked about the level of their physical effort at the end of the event.
- d) Combatives Simulation (**this simulation does NOT involve any manner of combat or physical interaction between Soldiers): Wearing a tactical "load" (approximately 35 lbs including uniform items), Soldiers will a tire-flip, SKEDCO pull, 25-pound sandbag throw, and a barrel rotation (rotate a 55 gal barrel on a plywood base). These tasks capture physical movements endemic to hand-to-hand combat (e.g., pushing, pulling, throwing to the ground, twisting) without asking Soldiers to engage in actual combatives. Soldiers will proceed at their own pace, may stop and rest, may self administer nutrients and water, and may stop the exercise at any time. Soldiers will be allowed to wear a heart-rate monitor (similar to wearing a wristwatch with a chest strap) if they chose to do so. This event will be filmed and Soldiers will be asked about the level of their physical effort at the end of the event.

6. On day three, volunteers will execute a "composite course" (run all four WTBD simulations back-to-back). Soldiers will proceed at their own pace, may stop and rest, may self administer nutrients and water, and may stop the exercise at any time. Soldiers will be allowed to wear a heart-rate monitor (similar to wearing a wristwatch with a chest strap) if they chose to do so. This event will be filmed and Soldiers will be asked about the level of their physical effort at the end of the event.

7. On day four:

- a) Participants will complete a 6 mile tactical foot march. Wearing a tactical "fighting load" (approximately 80 lbs including uniform items and weapon), Soldiers will march 6 miles (three repetitions of the approved 2-mile run course). Soldiers will proceed at their own pace, may stop and rest, may self administer nutrients and water, and may stop the exercise at any time. Soldiers will be allowed to wear a heart-rate monitor (similar to wearing a wristwatch with a chest strap) if they chose to do so. Portions of this event will be filmed and Soldiers will be asked about the level of their physical effort approximately every $\frac{1}{2}$ mile.
- b) If they choose to do so, volunteers will transition directly from the foot march to the composite course, detailed in step 6, above.

B. **Compensation** (*Specify the method of compensation (e.g., money, gift certificates, prizes, toys, etc.). If payment schedules are complex, it is suggested that a table is included showing the frequency and amount of compensation.*)
N/A

C. **Behavioral Observation**
Describe the focus, duration, and number of observations and specify how the observations will be recorded. *NOTE: If this information has been described in detail in item 15.A., it is acceptable to check the box and enter "see 15.A."*
See 15A

D. **Randomization**
Describe the randomization process. *NOTE: If this information has been described in detail in item 8.A., it is acceptable to check the box and enter "see 8.A."*
N/A

E. **Blinding**
Describe who will be blinded. Describe if and when research results or previously blinded treatment assignments will be made available to participants. Describe the provisions for breaking the blind (e.g., emergency situations, participant's request, etc.). *NOTE: If this information has been described in detail in item 15.A., it is acceptable to check the box and enter "see 15.A."*
N/A

F. **Surveys, Interviews, Questionnaires**
If surveys, interviews or questionnaires will be conducted with this study, indicate who will conduct the survey, interview or questionnaire and their qualifications. In addition, describe the setting and mode of administering the instrument (e.g., by telephone, one-on-one, group, etc.) and attach a copy of the instrument. *NOTE: If this information has been described in detail in item 15.A., it is acceptable to check the box and enter "see 15.A."*
N/A

G. **Document and Artifact Collection**
Describe any documents or other artifacts (e.g., student written assignments) that are to be collected.
N/A

H. **Deception, Withholding or Postponing Medications/Treatments, or Imposing other Restrictions**
Describe the methods of deception to be used, the medications being withheld or postponed, the length of time medications will be withheld or postponed, any other restrictions to be imposed on participants (e.g., diet, exercise), and the precautions taken to decrease or eliminate risks to participants.
N/A

I. **Data Collection, Storage of Data/Specimens and/or Issues of Confidentiality**

i. Describe the storage of research information including data (hard copies and electronic databases, audio/videotapes, etc.). Indicate who will have access to the research information, where it will be stored, and how long it will be kept. In addition, describe the final disposition of research information when the study is concluded (e.g., will information be destroyed or will the PI maintain the information). *NOTE: If this information has been described in detail in item 15.A., it is acceptable to check the box and enter "see 15.A."*

All information obtained during this effort will be treated as privileged and confidential, and will be seen only by the identified researchers involved in the study on a need-to-know basis. Participants will not provide any PII to

IMT-CoE team members, and will be asked to remove Army name tags, rank, and other identifying information from their persons prior to participation in the WTBD scenarios/filming. Soldiers who volunteer to participate will be assigned a 5-digit identification number, which will be used to coordinate information gathering throughout the four-day operation. Soldiers who cannot remove Army name/rank etc., from their uniforms (e.g., if tags are sewn on) will be asked to cover PII with small pieces of obscuring tape (provided by the IMT-CoE team). Lessons Learned from WTBD performance observations will be used to refine WTBD criterion measures, and to develop the two study protocols described in Section 6. As this is neither a study nor a research effort, none of the information gathered will be published or reported. Video recordings will be hand-carried, by the principal investigator, from the FT Carson site to the home office, and maintained on a double-password-protected data file stored on a non-networked computer to which only the principal investigator has access. Video recordings will be deleted upon completion of the full study.

- ii. Describe how the confidentiality of participants will be assured. Include a description of any issues specific to the study that might increase the risk of breach of confidentiality. For example, video/audiotapes, discovering information about the participant that could be harmful if released such as mental illness, genetic information, sexual preference, drug abuse, etc. Describe how codes will be generated if codes are used to protect identities, and who will have access to such codes. If a certificate of confidentiality will be provided, include the name of the person holding the certificate. NOTE: If this information has been described in detail in item 15A., it is acceptable to check the box and enter "see 15A."

Participants will not provide any PII to IMT-CoE team members, and will be asked to remove Army name tags, rank, and other identifying information from their persons prior to participation in the study/filming. Soldiers who cannot remove Army name/rank etc., from their uniforms (e.g., if tags are sewn on) will be asked to cover PII with small pieces of obscuring tape (provided by the IMT-CoE team). Soldiers who volunteer to participate will be assigned a 5-digit identification number, which will be used to coordinate information gathering throughout the four-day operation. Video recordings will be hand-carried, by the principal investigator, from the FT Carson site to the home office, and maintained on a double-password-protected data file stored on a non-networked computer to which only the principal investigator has access. Video recordings will be deleted upon completion of the full study.

J. Audio or Video Taping

Video recordings will be hand-carried, by the principal investigator, from the FT Carson site to the home office, and maintained on a double-password-protected data file stored on a non-networked computer to which only the principal investigator has access. Video recordings will be deleted upon completion of the full study.

K. Use or Disclosure of Protected Health Information

- i. Will Protected Health Information (PHI) be accessed (used) in the course of screening/recruiting for this research? Protected health information (PHI) is individually identifiable health information that is or has been collected or maintained by IMTCoE, including information that is collected for research purposes only, and can be linked back to the individual participant.

No
 Yes

If "Yes," the following 3 conditions must be met:

1. *The use or disclosure of the PHI is sought solely for the purpose of this research protocol.*
2. *The PHI will not be removed from IMTCoE.*
3. *The PHI is necessary for the purpose of this research study.*

- ii. Does this research use or disclose Protected Health Information (PHI)?

No

Yes If "Yes," please complete the IMTCoE HIPAA Compliance Form for submission with this Application. It can be accessed at HIPAA Compliance.

16. Financial Liability for Study Participants

Complete the table below, indicating who is responsible for payment of research activities and procedures. (Limit list to *research activities and procedures*.) Table may be modified as necessary to accommodate more items.

Procedure/Activity	Frequency	Responsible for Payment	
		<input type="checkbox"/> Sponsor	<input type="checkbox"/> Investigator
		<input type="checkbox"/> Department	
		<input type="checkbox"/> Patient	

17. Potential Conflict of Interest

A. Is there a potential conflict of interest for the Principal Investigator or key research personnel? *Assessment should include anyone listed as Principal Investigator, or other research personnel on page 1 of this application. Please note that the thresholds of ownership described below apply to the aggregate ownership of an individual investigator, his/her spouse, domestic partner and dependent children (e.g., if an investigator, his/her spouse, domestic partner and dependent children own together \$10,000 or 5% worth of equities in the sponsor, it should be reported below). Do not consider the combined ownership of all investigators.*

No

Yes If "Yes," the protocol must be reviewed by the IMTCoE IRB.

NOTE: Although approval may be granted by the IRB, the Investigator may not proceed with the research until a final determination has been rendered by the Deputy CG IMTCoE.

B. If "Yes," check all that apply:

- Compensation whose value could be affected by the study outcome.
- A proprietary interest in the tested product included but not limited to, a patent, trademark, copyright or licensing agreement, or the right to receive royalties from product commercialization.
- Any equity interest in the sponsor or product whose value cannot be readily determined through preference to public prices (e.g., ownership interest or stock options).
- Any equity interest in the sponsor or product that exceeds \$10,000 or 5%.
- Significant payments or other sorts with a cumulative value of \$10,000 made directly by the sponsor to any of the investigators listed on page 1 of this application as an unrestricted research or educational grant, equipment, consultation or honoraria.

Significant payments or other sorts with a cumulative value of \$10,000 made directly by the sponsor to any of the investigators listed on page 1 of this application as an unrestricted research or educational grant, equipment, consultation or honoraria.

PRINCIPAL INVESTIGATOR'S ASSURANCE STATEMENT

I certify that the information provided in this application is complete and accurate.

I understand that as Principal Investigator, I have ultimate responsibility for the conduct of the study, the ethical performance of the project, the protection of the rights and welfare of human participants, and strict adherence to the study protocol and any stipulations imposed by the Initial Military Training Center of Excellence (IMTCOE) Institutional Review Board.

I understand that, should I use the project described in this application as a basis for a proposal for funding (either internal or external), it is my responsibility to ensure that the human participants' involvement as described in the funding proposal(s), is consistent in principle, to that contained in this application. I will submit modifications and/or changes to the IRB as necessary, in the form of an amendment, to ensure these are consistent.

I agree to comply with all IMTCOE policies and procedures, as well as with all applicable federal, state, and local laws regarding the protection of human participants in research, including, but not limited to:

- Ensuring all investigators and key study personnel have completed the IMTCOE human subjects training program;
- Ensuring the project is conducted by qualified personnel following the approved IRB application and study protocol;
- Implementing no changes in the approved IRB application, study protocol, or informed consent document without prior IRB approval in accordance with IMTCOE IRB policy (except in an emergency, if necessary to safeguard the well-being of a human participant, and will report to the IRB within 5 days of such change);
- Obtaining the legally effective informed consent from human participants or their legally responsible representative, using only the currently approved date-stamped informed consent documents, and providing a copy to the participant, if applicable.
- Promptly report to the IRB, Data Safety and Monitoring Boards, sponsors and appropriate federal agencies any adverse experiences and all unanticipated problems involving risks to human subjects or others that occur in the course of the research in accordance with IMTCOE IRB Policies and Procedures.
- If unavailable to conduct this research personally, as when on sabbatical leave or vacation, I will arrange for another investigator to assume direct responsibility for the study. Either this person is named as another investigator in this application, or I will notify the IRB of such arrangements;
- Promptly providing the IRB with any information requested relative to the project;
- Promptly and completely complying with an IRB decision to suspend or withdraw approval for the project;
- Obtaining Continuing Review approval prior to the date the approval for the study expires. I understand if I fail to apply for continuing review, approval for the study will automatically expire, and all study activity must cease until IRB approval is granted;
- Maintain accurate and complete research records, including, but not limited to, all informed consent documents for 3 years from the date of study completion;
- Maintain any authorization documents to use or disclose PHI for 6 years from the date authorization is obtained; and
- Fully informing the IMTCOE IRB of all locations in which human participants will be recruited for this project and being responsible for obtaining and maintaining current IRB approvals/letters of cooperation when applicable.


Signature Principal Investigator


Date

By my signature, I certify that I have evaluated this research application for soundness of research design and scholarly merit in accordance with departmental policy and the adequacy of facilities and resources.

FACULTY ADVISOR ASSURANCE STATEMENT
(Applicable for Student Data Requests)

*The faculty sponsor must be a member of the University Faculty. The faculty member is considered the responsible party for the legal and ethical performance of the project.

By my signature as sponsor on this research application, I certify that the student or guest investigator is knowledgeable about the regulations and policies governing research with human participants and has sufficient training and experience to conduct this particular study in accordance with the approved protocol. In addition,

- I agree to meet with the student investigator on a regular basis to monitor study progress;
- Should problems arise during the course of the study, I agree to be available, personally, to supervise the student investigator in solving them;
- I will ensure that all investigators and key study personnel have completed the IMTCoE human subjects training program;
- I will ensure that the project is performed only by qualified personnel according to the approved IRB application;
- I will ensure that the student investigator does not implement any changes to the approved IRB application or informed consent document without prior IRB approval in accordance with IMTCoE IRB policy (except in an emergency, if necessary to safeguard the well-being of human participants, and will report to the IRB within 5 days of such change);
- I will ensure that the student investigator only obtains legally effective informed consent from human participants or their legally responsible representative, only the currently approved date stamped informed consent documents for human participants are used; and a copy of the informed consent is provided to the participant.
- I will ensure that the study investigator promptly reports any unanticipated problems involving risks to participants or others, or any serious adverse events (whether anticipated or not) to the IRB in accordance with IMTCoE IRB Policies and Procedures;
- I will assume the responsibility for the accurate documentation, investigation and follow-up of all possible study related adverse events and unanticipated problems involving risks to participants.
- If I will be unavailable to supervise this research personally, as when on sabbatical leave or vacation, I will arrange for an alternate Faculty Advisor to assume direct responsibility in my absence and I will advise the IRB by letter in advance of such arrangements;
- I will ensure that the student investigator promptly provides the IRB with any information requested relative to the project;
- I will ensure that the student investigator promptly and completely complies with an IRB Decision to suspend or withdraw approval for the project; and
- I will ensure that the student investigator obtains continuing review approval prior to the date approval for the study expires. Further, I understand that if the student investigator fails to apply for continuing review, approval for the study will automatically expire and I must ensure that all study activity ceases until IRB approval is obtained.

Faculty Sponsor's Signature

Date

By my signature, I certify that I have evaluated this research application for soundness of research design and scholarly merit in accordance with departmental policy and the adequacy of facilities and resources.

Department Chair's Signature

Date

¹Note: a relevant example of how similar organizations accomplish this goal is the Houston, TX Fire Department. The Houston Fire Department uses a job-related physical ability test designed to determine if an applicant has the requisite

strength and endurance needed to perform the job duties of a Firefighter. These job duties require balance, coordination, strength, endurance, and cardio-vascular fitness. Applicants are tested over seven (7) timed, pass/fail events while wearing gloves and an air pack because Firefighters are required to wear Self-Contained Breathing Apparatus (SCBA) and other heavy protective clothing while functioning at emergency incidents. The events include:

- Balance Beam Walk- within 30 seconds, one must walk the entire length of the beam.
- Ladder Extension - within 1 minute, an applicant must fully extend and lower the fly section of a 24' aluminum extension ladder by using the hand-over-hand method.
- Stair Climb - within 3 minutes 30 seconds, an applicant must pick up, shoulder hold, and carry two (2) 50' sections of hose, tied in a "Brown Fold," then climb and descend six (6) flights of stairs.
- Equipment Hoist - within 1 minute, an applicant standing on the 3rd floor of the drill tower, using the hand-over-hand method, must hoist one section of 2 ½" hose (44 lb.) from the ground up to the 3rd floor window, and then lower the hose back to the ground.
- Portable Equipment Carry - within 1 minute, an applicant must pick up an equipment/accessory box (Hurst, or Amkus, extrication tools) (70 lb.) from a 2' stand and carry it 50' in one direction, turn around to carry it back 50' and then place the box on a 3' stand.
- Rescue Attempt - within 30 seconds, an applicant must carry or drag a 150 lb. human dummy, 30 feet.
- 1.5 Mile Run - within 13 minutes 7 seconds, an applicant must run 1.5 miles.

ⁱⁱ Department of the Army, *Physical Readiness Training - FM 21-20* (Washington, D.C.: U.S. Government Printing Office, 1980), 1-2.

ⁱⁱⁱ FM 7-22 – “Army Physical Readiness Training”, Department of the Army, October, 2012.

^{iv} Warrior Tasks and Battle Drills, IMTCoE, March 2013.

^v Soldier’s Manual of Common Tasks, IMTCoE, 2013.

^{vi} TRADOC PAM 257-3-7: *The Army Human Dimension Concept*, Department of the Army, 2013; Sharon L. Plowman and Denise L. Smith. *Exercise Physiology for Health, Fitness, and Exercise*. Baltimore: Lippincott, Williams and Wilkins, 2008; Tudor W. Bompa. *Periodization Training: Theory & Methodology of Training*. Champaign, Ill: Human Kinetics, 1999.

^{vii} Personal conversation with Dr. William Brechue, FACSM (9 July 2013).

^{viii} Belinda R. Beck, “Stress Fractures,” *ACSM Current Comment* (Indianapolis, IN: American College of Sports Medicine, , 2007), 1 – available at: <http://www.acsm.org> (accessed 3 May 2011); Note: based upon the American College of Sports Medicine “Current Comment” on stress fractures, we know it take about six weeks of adaptive exercise before bone density and connective tissue improve enough to help prevent stress-reaction injuries; “Bones are most susceptible to stress fracture when weakened by remodeling-related porosity, a primary stage in the adaptive response of bone to changes in patterns of loading.” (p. 2)

^{ix} Andrew M. Jones, “The Physiology of the World Record Holder for the Women’s Marathon” *International Journal of Sport Science & Coaching* 1:2 (2006): 101-116; Scott Powers and Edward Howley, *Exercise Physiology: Application to Theory and Performance*. Columbus, OH: McGraw Hill Publishing Co, 2013.

^x Whitfield B. East, *A Historical Analysis of Army Physical Readiness Training and Assessment*, FT Leavenworth, KS: Combined Arms Institute Press, US Army Combined Arms Center, March 2013.

^{xii} Paul J. Sharkey and Brian O. Davis. *Hard Work: Defining Physical Work Performance Requirements*. Champaign, Ill: Human Kinetics, 2008; Per-Olof Astrand, Kaare Rodahl, Hans A. Dahl and Sigmund B. Stromme. *Textbook of Work Physiology*. Champaign, Ill: Human Kinetics, 2003.

^{xiii} Jones, “Physiology of the World Record Holder”, 112.

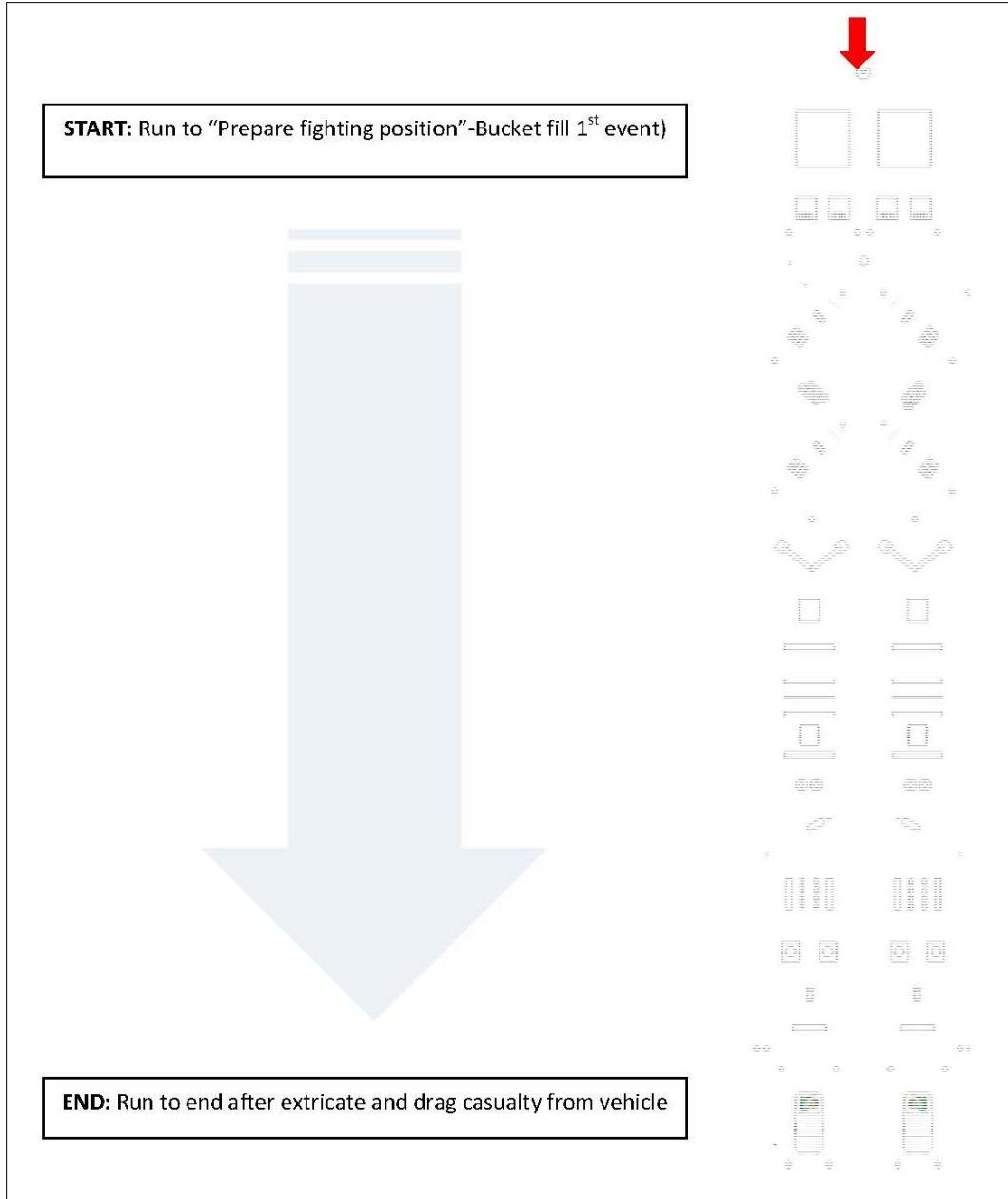
^{xiv} Note: based upon the April 2009 *Armed Forces Medical Surveillance Monthly Report*, there were 7.8 million ambulatory visits for illness and injury during 2008; the largest percentage (> 24%) of visits were caused by musculoskeletal and connective tissue injuries – generally construed to be “overuse” injuries (approximately 1.9 million visits); Larkin, 2010, p. 41-42.

^{xv} Bruce Ruscio, et al., *DOD Military Injury Prevention Priorities Working Group: Leading Injuries, Causes and Mitigation Recommendations* (Washington, DC: Office of the Assistant Secretary of Defense for Health Affairs, February 2006), 1, 4, 7; *Preventing Injuries in the U.S. Military: The Process, Priorities, and Epidemiologic Evidence* (Aberdeen Proving Ground, MD: Army Center for Health Promotion and Preventive Medicine, December 2008), Section 1-1, A(2), 1-2.

^{xvi} Christopher P. Larkin, “Combat Fitness a Concept Vital to National Security” (Paper - Master of Science, Department of Defense: Joint Forces Staff College, 18 June 2010), 100; Note: MAJ Larkin extrapolated these data, which were derived from the following source: Armed Forces Health Surveillance Center. “Ambulatory Visits among Members of Active Components, U.S. Armed Forces, 2008,” *Medical Surveillance Monthly Report* 16:4 (April, 2009): 10.

APPENDIX Q
Fort Carson Field Study, September 2013
Description of Field Events

Diagram and Spreadsheet contributed by Don Goddard, AIPH Ergonomics Program



Day 1 – Army Combat Uniform (ACU)

Day 2 – Fighting Load,

Day 3 – Fighting Load (after 10 K Ruck March w Sustainment Load)

Individual Equipment List

ACU		[Sustainment Load]	
Boots	5.00	Poncho	1.05
Jacket & trouser	3.20	Liner Poncho	1.14
Multi tool	0.50	Assault Pack w/ waist pack	4.2
Rigger Belt	0.50	Water – 3L or 100 oz	7.10
Patches	0.49	Hygiene Kit	1.0
Patrol Cap	0.48	Undershirt moisture wicking x 1 ea	0.35
ID Tags	0.38	Socks x 1 pr	0.20
Undershirt	0.35	Improved Rain suit Top	1.7
Gloves	0.25	Improved Rain suit Bottom	1.7
Eye Pro	0.25	Meal Ready To Eat (MRE) 1 ea (1.50/0.68 kg)	1.5
Notebook	0.25	Undershirt moisture wicking x 1 ea	0.35
Underwear (shirt/Drawers)	0.55	Socks x 1 pr	0.20
Socks	0.20	Improved Cleaning Kit	1.6
Wrist Watch	0.19	Chemlight (2per)	0.04
Ear Plugs	0.13	Water purification tablets	0.02
Chapstick	0.01		
ID Card	0.01		
Sports Bra	0.20		

Fighting Load

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Fort Carson Field Event Descriptions				
Category	Test Item	Movement	Action	Demands
Fighting Position	Start	Move to Bucket Fill	Run	52 ft
	Bucket Fill	Fill Buckets	Shovel	minute, total weight can + bucket, bucket weight)
	Transition	Move bucket fill to sandbag stack	Walk	8 ft
	Sandbag Stack	Stack Sandbags	Lift	40 lb sandbag x 16
			Carry	(40 lb sandbag 18 ft) x 16
			Lower	40 lb sandbag x 16
	Transition	Move from flag 1 to flag 2 between tables	Run	18 ft
	Transition	Move from flag 2 to flag 3 at high crawl	Run	35 ft
Move O-U-A-T	High Crawl	High Crawl	High Crawl	20 ft
	Transition	Stand		
	Short Run	Run from flag 4 to high wall	Run	25 ft
	High Wall	Jump high wall	Jump	1 ft high sandbag pile
	Short Run	Run from high wall to wide wall	Run	13 ft
	Wide Wall	Jump wide wall	Jump	4.5 wide 4 x 4 sandbag obstruction
	Short Run	Run from wide wall to cone (flag 5)	Run	15 ft
	Short Run	Run from flag 5 to tires	Run	39 ft
	Tire Run	Run through 6 tires	Run	12 ft of tires (6 steps)
	Short Run	Run from tires to cone (flag 6)	Run	38 ft
	Short Run	Run from flag 6 to high wall	Run	15 ft
	High Wall	Jump high wall	Jump	1 ft high sandbag pile
	Short Run	Run from high wall to wide wall	Run	13 ft
	Wide Wall	Jump wide wall	Jump	4.5 wide 4 x 4 sandbag obstruction
	Short Run	Run from wide wall to cone (flag 7)	Run	12 ft
	Short Run	Run from flag 7 to balance beam	Run	15 ft
	Balance Beam	Pick up saw and ammo can	Lift	18.3 lb saw and 29.3 lb ammo can
		Negotiate balance beam	Walk	12' beam length x 2
		Lower saw and ammo can	Lower	18.3 lb saw and 29.3 lb ammo can
	Transition	Run from flag 8 end of balance beam to flag 9 front of rucks	Run	30 ft
	Transition	Run from flag 9 to flag 10 at one end of the rucksack carry over	Run	15 ft
	Platform Mount	Lift rucksack	Lift	53 lb rucksack from ground and place on 4 ft high platform (4'2" x 4' x 4')
		Climb platform	Climb	Climb on top of 4 ft high platform
		Move over platform	Move	Move over 4'2" long platform
		Jump to ground	Jump	Jump 4 ft from top of platform to ground
		Pull rucksack across platform	Pull	platform
		Lower rucksack	Lower	to ground 4 ft below
	Transition	Run from rucksack platform to high wall	Run	wall
High Wall	Negotiate high wall	Climb	Climb 4' 6" high wall	
	Short Run	Run from high wall low wall	Run	16 ft
	Low Wall	Negotiate low wall	Climb	Climb 3' 6" low wall
	Short Run	Run from low wall to roll under	Run	10 ft
	Roll Under	Roll under obstacle	Roll	under 2 ft high pipe
	Short Run	Run from pipe to low wall	Run	10 ft
	Low Wall	Negotiate low wall	Climb	Climb 3' 6" low wall
	Short Run	Run from low wall to tunnel	Run	10 ft
	Tunnel	Crawl through tunnel	Crawl	4' 6" through tunnel (4'4" x 4'6" x 2'9")
	Short Run	Run from tunnel to low wall	Run	10 ft
	Low Wall	Negotiate low wall	Climb	Climb 3' 6" low wall
	Short Run	Run from low wall to BA Tire	Run	22 ft

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Fort Carson Field Event Descriptions, Continued (page 2)				
Category	Test Item	Movement	Action	Demands
Perform Combatives	Tire Flip	Lift tire 2 x 2 times	Lift	102 lb tire
		Push tire over 2 x 2 times	Push	___ lb
	Short Run	Run from BA tire to Skedco flag 11	Run	17 ft
	Skedco Pull	Pull Skedco	Pull	Pull Skedco using 53.3 force 40 ft x 2
	Short Run	Run from Skedco cone (flag 11) to flag 12	Run	14 ft
	Short Run	Run from flag 12 to sandbag toss	Run	15 ft
	Sandbag Toss	Throw sandbags over wall	Lift	30 lb sandbag x 4
			Throw	Throw over 4'6" wall x 4
	Short Run	Run from sandbag toss to trashcan	Run	19 ft
	Trashcan Turn	Turn trashcan	Turn	Turn 55 gal trashcan x 4 revolutions using 60 lbs of force
	Short Run	Run from trashcan to low barrier	Run	25 ft
	Short Run	Run from low barrier to high barrier	Run	Run 30 ft
	Short Run	Run from high barrier to HMMWV	Run	31 ft
Casualty Evacuation	Evacuate Casualty	Extricate casualty	Pull	Pull casualty out of HMMWV using ___ lb force
			Lower	Lower casualty ___ ft to ground
	Casualty Drag	Casualty Drag	Drag	Pull casualty 45 ft using 112 lb force
	Finish	Run from HMMWV to finish line	Run	67 ft

APPENDIX R
Fort Carson Field Study, Sept 2013-
Rankings of Physically Difficult Tasks

Prepared by USAPHC-IPP,
as discussed in Section 9.2 of this PHR

Table R-1. Analyses of Reported Most Physically Demanding Events, Fort Carson Field Study

APPENDIX S

Fort Carson Field Study, Sept 2013 Correlation Analyses

This appendix contains the key findings of the correlation analyses conducted on data collected during the Sept 2013 Fort Carson field study described in Section 9 of this report. Due to the expected variation and confounding in these types of associations, statistically-significant Pearson correlation (r) values greater than 0.4 were considered noteworthy. However, more specific rankings of the noted correlation values were assessed based on the following scale:

Ranking Scale used to Assess Correlation (r) values

<.4	LOW
<u>>.4 <.5</u>	MODERATE
<u>≥.5 <.7</u>	HIGH
<u>≥.7</u>	VERY HIGH

Correlation Matrices
Tables S-1 through S-12

Table S-1. FEMALES in ACU: Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables

Table S-2. FEMALES in Fighting Load (FL): Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables

Table S-3. FEMALES in FL After 6.2 Mile Road March: Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables

Table S-4. MALES in ACU: Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables

Table S-5. MALES in FL: Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables

Table S-6. MALES in FL After 6.2 Mile Road March: Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables

Table S-7. Soldiers in ACU Performed Each Task in Random Order: Correlation of Field Events with Each other

Table S-8. Soldiers in ACU Performed Each Task in Order through Course: Correlation of Field Events with Each other

Table S-9. Soldiers in Fighting Load (FL) Performed Each Task in Order through Course: Correlation of Field Events with Each other

Table S-10. Soldiers in FL Performed Each Task in Order through Course After 6.2 Mile Road March: Correlation of Field Events with Each other

Table S-11. 6.2 Mile Road March Correlated with Height, Weight, and APFT Variables

Table S-12. 6.2 Mile Road March Correlated with Tasks and Individual Events (Day 3, After Road March)

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Table S-1. FEMALES in ACU: Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables															
		Bucket Fill	Sandbag Stack	FIGHTING POSITION TASK	Balance Beam	Over High Wall	MOUAT TASK	Tire Flip	Skedco Pull	Sandbag Toss	COMBAT TASK	Vehicle Door	Casualty Extraction	Casualty Drag	CASUALTY EVACUATION TASK
Weight	correlation	-.369	-.498	-.605	.062	.148	.138	-.125	-.526	-.322	-.408	.200	-.132	-.333	-.320
	p-value (N)	.018 (41)	.001 (41)	.000 (40)	.702 (40)	.356 (41)	.396 (40)	.448 (39)	.001 (39)	.052 (37)	.008 (41)	.209 (41)	.417 (40)	.036 (40)	.041 (41)
Height	correlation	-.244	-.567	-.488	-.086	-.077	-.101	-.331	-.580	-.378	-.500	-.020	-.471	-.398	-.535
	p-value (N)	.124 (41)	.000 (41)	.001 (40)	.596 (40)	.632 (41)	.534 (40)	.039 (39)	.000 (39)	.021 (37)	.001 (41)	.900 (41)	.002 (40)	.011 (40)	.000 (41)
BMI	correlation	-.298	-.234	-.436	.155	.264	.271	.085	-.246	-.152	-.156	.303	.198	-.129	.005
	p-value (N)	.059 (41)	.140 (41)	.005 (40)	.340 (40)	.095 (41)	.091 (40)	.605 (39)	.131 (39)	.370 (37)	.332 (41)	.054 (41)	.221 (40)	.426 (40)	.976 (41)
Total APFT	correlation	.166	-.103	.222	-.247	-.116	-.252	-.310	.149	-.311	-.100	.053	-.139	-.112	-.079
	p-value (N)	.407 (27)	.609 (27)	.277 (26)	.223 (26)	.565 (27)	.213 (26)	.123 (26)	.468 (26)	.131 (25)	.620 (27)	.791 (27)	.497 (26)	.585 (26)	.697 (27)
Run Time	correlation	-.347	-.071	-.075	-.344	-.050	-.309	-.112	-.351	-.216	-.260	-.008	-.178	.052	-.013
	p-value (N)	.065 (29)	.715 (29)	.704 (28)	.073 (28)	.796 (29)	.110 (28)	.570 (28)	.067 (28)	.279 (27)	.173 (29)	.969 (29)	.364 (28)	.794 (28)	.946 (29)
Run Score	correlation	.156	-.101	.173	-.090	-.125	-.134	.008	.326	-.238	.098	.124	.088	-.063	.078
	p-value (N)	.384 (33)	.577 (33)	.345 (32)	.624 (32)	.488 (33)	.463 (32)	.964 (32)	.069 (32)	.197 (31)	.588 (33)	.491 (33)	.633 (32)	.732 (32)	.667 (33)
Sit-Up Reps	correlation	.163	.103	.310	-.288	-.079	-.259	-.235	.055	-.059	.002	-.162	-.065	-.121	-.247
	p-value (N)	.406 (28)	.603 (28)	.115 (27)	.146 (27)	.688 (28)	.192 (27)	.237 (27)	.785 (27)	.775 (26)	.992 (28)	.410 (28)	.746 (27)	.549 (27)	.206 (28)
Sit-Up Score	correlation	.029	.001	.192	-.319	.051	-.261	-.279	-.008	-.127	-.086	-.130	-.160	-.078	-.260
	p-value (N)	.872 (33)	.996 (33)	.293 (32)	.076 (32)	.777 (33)	.150 (32)	.122 (32)	.966 (32)	.497 (31)	.634 (33)	.470 (33)	.382 (32)	.672 (32)	.143 (33)
Push-Up Reps	correlation	-.046	-.070	-.197	.165	.205	.183	-.132	-.033	.081	-.055	.073	.064	-.291	-.156
	p-value (N)	.814 (29)	.719 (29)	.315 (28)	.400 (28)	.287 (29)	.352 (28)	.503 (28)	.869 (28)	.687 (27)	.776 (29)	.705 (29)	.746 (28)	.132 (28)	.418 (29)
Push-Up Score	correlation	.088	-.210	-.084	.000	-.024	-.055	-.207	-.096	-.232	-.222	.161	-.026	-.132	.010
	p-value (N)	.627 (33)	.242 (33)	.649 (32)	.998 (32)	.896 (33)	.764 (32)	.255 (32)	.600 (32)	.209 (31)	.214 (33)	.371 (33)	.889 (32)	.473 (32)	.957 (33)

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Table S-2. FEMALES Wearing Fighting Load (FL): Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables															
		Bucket Fill	Sandbag Stack	FIGHTING POSITION TASK	Balance Beam	Over High Wall	MOUAT TASK	Tire Flip	Skedco Pull	Sandbag Toss	COMBAT TASK	Vehicle Door	Casualty Extraction	Casualty Drag	CASUALTY EVACUATION TASK
Weight	correlation	-.225	-.599	-.580	-.194	.023	-.141	-.227	-.518	-.294	-.267	.057	-.376	-.392	-.341
	p-value (N)	.163 (40)	.000 (40)	.000 (40)	.230 (36)	.893 (40)	.386 (36)	.182 (36)	.001 (39)	.069 (40)	.095 (40)	.726 (40)	.017 (39)	.014 (40)	.031 (40)
Height	correlation	-.083	-.552	-.499	-.235	-.237	-.284	-.171	-.458	-.393	-.331	-.191	-.462	-.343	-.448
	p-value (N)	.611 (40)	.000 (40)	.001 (40)	.145 (40)	.165 (36)	.076 (40)	.318 (36)	.005 (36)	.013 (39)	.037 (40)	.238 (40)	.003 (40)	.032 (40)	.004 (40)
BMI	correlation	-.245	-.390	-.406	-.101	.213	.025	-.177	-.342	-.104	-.100	.232	-.137	-.249	-.094
	p-value (N)	.128 (40)	.013 (40)	.009 (40)	.537 (40)	.212 (36)	.878 (40)	.302 (36)	.041 (36)	.531 (39)	.541 (40)	.149 (40)	.399 (40)	.126 (39)	.562 (40)
Total APFT	correlation	.166	-.041	.012	-.142	-.368	-.211	-.154	.216	-.132	.014	-.207	-.024	.245	-.078
	p-value (N)	.417 (26)	.844 (26)	.952 (26)	.489 (26)	.092 (22)	.302 (26)	.482 (23)	.321 (23)	.529 (25)	.946 (26)	.311 (26)	.908 (26)	.239 (25)	.705 (26)
Run Time	correlation	-.125	-.309	-.278	-.029	.325	.023	-.217	-.373	-.027	-.338	-.091	-.204	-.182	-.131
	p-value (N)	.525 (28)	.110 (28)	.152 (28)	.882 (28)	.121 (24)	.908 (28)	.308 (24)	.072 (24)	.895 (27)	.079 (28)	.644 (28)	.297 (28)	.364 (27)	.506 (28)
Run Score	correlation	.010	.066	.033	-.127	-.324	-.024	.085	.127	-.050	.141	-.043	.109	.071	-.045
	p-value (N)	.955 (32)	.721 (32)	.858 (32)	.489 (32)	.092 (28)	.898 (32)	.669 (28)	.520 (28)	.788 (31)	.440 (32)	.816 (32)	.553 (32)	.702 (31)	.805 (32)
Sit-Up Reps	correlation	.259	-.016	.060	.142	-.265	-.074	-.229	.099	-.097	-.130	-.282	-.081	.130	-.014
	p-value (N)	.193 (27)	.937 (27)	.767 (27)	.480 (27)	.222 (23)	.712 (27)	.283 (24)	.646 (24)	.636 (26)	.517 (27)	.154 (27)	.687 (27)	.526 (26)	.944 (27)
Sit-Up Score	correlation	.275	-.024	.062	.149	-.160	-.128	-.233	.016	-.034	-.090	-.253	-.027	.145	-.024
	p-value (N)	.128 (32)	.897 (32)	.734 (32)	.415 (32)	.416 (28)	.486 (32)	.232 (28)	.935 (28)	.857 (31)	.624 (32)	.162 (32)	.885 (32)	.436 (31)	.897 (32)
Push-Up Reps	correlation	.040	-.008	.021	-.210	-.051	-.140	.147	.344	-.227	-.007	.029	-.156	.098	-.081
	p-value (N)	.838 (28)	.966 (28)	.915 (28)	.285 (28)	.813 (24)	.477 (28)	.483 (25)	.092 (25)	.255 (27)	.973 (28)	.882 (28)	.427 (28)	.628 (27)	.684 (28)
Push-Up Score	correlation	.094	-.178	-.100	-.404	-.140	-.236	.119	.312	-.126	.092	-.014	-.233	.047	-.137
	p-value (N)	.611 (32)	.330 (32)	.586 (32)	.022 (32)	.477 (28)	.193 (32)	.546 (28)	.106 (28)	.501 (31)	.617 (32)	.939 (32)	.200 (32)	.803 (31)	.454 (32)

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Table S-3. FEMALES in FL After 6.2 Mile Road March: Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables															
		Bucket Fill	Sandbag Stack	FIGHTING POSITION TASK	Balance Beam	Over High Wall	MOUAT TASK	Tire Flip	Skedco Pull	Sandbag Toss	COMBAT TASK	Vehicle Door	Casualty Extraction	Casualty Drag	CASUALTY EVACUATION TASK
Weight	correlation	-.276	-.432	-.398	-.030	-.285	-.156	.084	-.535	-.322	-.241	-.186	-.057	-.336	-.424
	p-value (N)	.120 (33)	.012 (33)	.022 (33)	.867 (33)	.134 (29)	.401 (31)	.670 (28)	.003 (29)	.077 (31)	.191 (31)	.299 (33)	.760 (31)	.070 (30)	.016 (32)
Height	correlation	-.256	-.569	-.440	-.227	-.486	-.435	-.303	-.578	-.201	-.499	-.070	-.162	-.361	-.493
	p-value (N)	.151 (33)	.001 (33)	.010 (33)	.203 (33)	.008 (29)	.014 (31)	.117 (28)	.001 (29)	.278 (31)	.004 (31)	.697 (33)	.384 (31)	.050 (30)	.004 (32)
BMI	correlation	-.173	-.153	-.201	.120	.009	.121	.319	-.250	-.298	.056	-.208	.068	-.150	-.191
	p-value (N)	.336 (33)	.396 (33)	.262 (33)	.507 (33)	.964 (29)	.517 (31)	.098 (28)	.191 (29)	.104 (31)	.766 (31)	.247 (33)	.716 (31)	.428 (30)	.296 (32)
Total APFT	correlation	.000	-.124	-.082	-.247	-.345	-.313	-.404	.112	.213	-.394	.288	.102	-.035	-.089
	p-value (N)	1.000 (24)	.564 (24)	.705 (24)	.246 (24)	.136 (20)	.145 (23)	.077 (20)	.640 (20)	.329 (23)	.063 (23)	.172 (24)	.644 (23)	.874 (23)	.688 (23)
Run Time	correlation	.090	-.007	.078	.172	.093	.111	.092	-.170	-.256	.087	-.264	.177	-.479	-.075
	p-value (N)	.662 (26)	.972 (26)	.706 (26)	.400 (26)	.680 (22)	.598 (25)	.685 (22)	.450 (22)	.227 (24)	.678 (25)	.192 (26)	.398 (25)	.015 (25)	.723 (25)
Run Score	correlation	-.188	-.024	-.149	-.198	-.117	-.079	-.033	-.064	.208	-.116	.232	-.128	.356	.025
	p-value (N)	.320 (30)	.901 (30)	.432 (30)	.293 (30)	.568 (26)	.688 (28)	.875 (25)	.755 (26)	.287 (28)	.557 (28)	.217 (30)	.507 (29)	.058 (29)	.897 (29)
Sit-Up Reps	correlation	.266	.036	.177	.084	-.294	-.119	-.436	-.058	.375	-.395	.410	.038	-.434	-.240
	p-value (N)	.199 (25)	.865 (25)	.398 (25)	.691 (25)	.195 (21)	.579 (24)	.048 (21)	.801 (21)	.071 (24)	.056 (24)	.042 (25)	.859 (24)	.034 (24)	.258 (24)
Sit-Up Score	correlation	.171	-.132	.026	-.025	-.371	-.177	-.413	.038	.147	-.302	.184	.199	-.447	-.137
	p-value (N)	.367 (30)	.486 (30)	.891 (30)	.894 (30)	.062 (26)	.368 (28)	.040 (25)	.854 (26)	.457 (28)	.118 (28)	.330 (30)	.300 (29)	.015 (29)	.479 (29)
Push-Up Reps	correlation	-.079	-.090	-.092	-.106	-.281	-.232	-.220	-.060	.081	-.341	.180	-.077	.087	-.094
	p-value (N)	.702 (26)	.661 (26)	.655 (26)	.605 (26)	.206 (22)	.264 (25)	.325 (22)	.790 (22)	.699 (25)	.096 (25)	.378 (26)	.716 (25)	.678 (25)	.656 (25)
Push-Up Score	correlation	-.021	-.086	-.057	-.131	-.116	-.129	-.139	-.025	.015	-.243	.115	.048	.005	-.083
	p-value (N)	.914 (30)	.652 (30)	.764 (30)	.491 (30)	.572 (26)	.512 (28)	.506 (25)	.905 (26)	.940 (28)	.212 (28)	.544 (30)	.807 (29)	.980 (29)	.669 (29)

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Table S-4. MALES in ACU: Individual Events and Associated TASK Groups with Weight, Height, and Fitness Variables															
		Bucket Fill	Sandbag Stack	FIGHTING POSITION TASK	Balance Beam	Over High Wall	MOUAT TASK	Tire Flip	Skedco Pull	Sandbag Toss	COMBAT TASK	Vehicle Door	Casualty Extraction	Casualty Drag	CASUALTY EVACUATION TASK
Weight	correlation	-.110	-.263	-.203	-.006	.019	.048	-.023	-.325	-.145	-.212	-.115	-.144	-.196	-.261
	p-value (N)	.101 (224)	.000 (224)	.003 (218)	.933 (218)	.783 (224)	.481 (218)	.733 (224)	.000 (224)	.030 (224)	.001 (223)	.086 (223)	.032 (224)	.003 (223)	.000 (223)
Height	correlation	-.135	-.264	-.232	-.131	-.059	-.114	-.119	-.283	-.256	-.246	-.055	-.109	-.253	-.247
	p-value (N)	.043 (224)	.000 (224)	.001 (218)	.053 (218)	.379 (224)	.093 (218)	.077 (224)	.000 (224)	.000 (224)	.000 (223)	.412 (223)	.104 (224)	.000 (223)	.000 (223)
BMI	correlation	-.042	-.137	-.085	.066	.054	.114	.046	-.198	-.009	-.088	-.099	-.097	-.073	-.149
	p-value (N)	.536 (224)	.040 (224)	.210 (218)	.334 (218)	.425 (224)	.094 (218)	.491 (224)	.003 (224)	.895 (224)	.188 (223)	.139 (223)	.147 (224)	.279 (223)	.026 (223)
Total APFT	correlation	-.156	-.040	-.125	-.064	-.025	-.120	-.118	-.041	-.146	-.105	-.050	-.056	.059	-.008
	p-value (N)	.048 (160)	.612 (160)	.121 (155)	.429 (155)	.758 (160)	.137 (155)	.136 (160)	.607 (160)	.066 (160)	.188 (159)	.532 (159)	.479 (160)	.461 (160)	.923 (159)
Run Time	correlation	.168	.265	.238	.169	.069	.223	.198	.124	.227	.164	.102	.104	-.019	.124
	p-value (N)	.030 (167)	.001 (167)	.002 (161)	.032 (161)	.374 (167)	.004 (161)	.010 (167)	.111 (167)	.003 (167)	.035 (166)	.192 (166)	.182 (167)	.810 (167)	.112 (166)
Run Score	correlation	-.184	-.222	-.265	-.161	-.129	-.242	-.235	-.096	-.266	-.173	-.127	-.125	.019	-.145
	p-value (N)	.009 (200)	.002 (200)	.000 (194)	.025 (194)	.069 (200)	.001 (194)	.001 (200)	.176 (200)	.000 (200)	.015 (199)	.073 (199)	.078 (200)	.790 (200)	.041 (199)
Sit-Up Reps	correlation	-.143	-.089	-.135	-.131	-.106	-.191	-.090	-.119	-.168	-.214	-.110	-.092	-.124	-.140
	p-value (N)	.069 (162)	.262 (162)	.093 (157)	.102 (157)	.181 (162)	.017 (157)	.257 (162)	.133 (162)	.033 (162)	.006 (161)	.164 (161)	.242 (162)	.115 (162)	.077 (161)
Sit-Up Score	correlation	-.188	-.099	-.250	-.062	-.107	-.121	-.172	-.096	-.191	-.215	-.136	-.103	-.122	-.172
	p-value (N)	.008 (201)	.161 (201)	.000 (195)	.389 (195)	.130 (201)	.093 (195)	.015 (201)	.176 (201)	.007 (201)	.002 (200)	.054 (200)	.145 (201)	.085 (201)	.015 (200)
Push-Up Reps	correlation	-.199	-.119	-.205	.029	-.093	-.089	-.225	-.116	-.119	-.188	-.073	-.053	-.044	-.110
	p-value (N)	.011 (162)	.133 (162)	.010 (157)	.714 (157)	.239 (162)	.270 (157)	.004 (162)	.142 (162)	.130 (162)	.017 (161)	.354 (161)	.502 (162)	.582 (162)	.165 (161)
Push-Up Score	correlation	-.200	-.124	-.261	-.005	-.121	-.135	-.223	-.114	-.110	-.172	-.096	-.078	-.018	-.128
	p-value (N)	.004 (201)	.080 (201)	.000 (195)	.949 (195)	.088 (201)	.060 (195)	.001 (201)	.108 (201)	.121 (201)	.015 (201)	.176 (200)	.272 (201)	.803 (201)	.072 (200)

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Table S-5. MALES in FL: Individual Events and Associated Task Groups with Height, Weight and Fitness Variables															
		Bucket Fill	Sandbag Stack	FIGHTING POSITION TASK	Balance Beam	Over High Wall	MOUAT TASK	Tire Flip	Skedco Pull	Sandbag Toss	COMBAT TASK	Vehicle Door	Casualty Extraction	Casualty Drag	CASUALTY EVACUATION TASK
Weight	correlation	-.096	-.178	-.201	.075	-.035	.024	-.151	-.328	-.124	-.279	-.173	-.046	-.233	-.261
	p-value (N)	.155 (219)	.008 (219)	.003 (213)	.279 (212)	.606 (219)	.724 (211)	.027 (215)	.000 (217)	.068 (219)	.000 (214)	.011 (215)	.497 (219)	.001 (219)	.000 (216)
Height	correlation	-.081	-.169	-.118	-.175	-.169	-.272	-.095	-.311	-.219	-.235	-.029	-.046	-.285	-.218
	p-value (N)	.233 (219)	.012 (219)	.085 (213)	.011 (212)	.012 (219)	.000 (211)	.186 (215)	.000 (217)	.001 (219)	.001 (214)	.673 (215)	.498 (219)	.000 (219)	.001 (216)
BMI	correlation	-.057	-.098	-.152	.182	.063	.185	-.105	-.187	-.004	-.170	-.174	-.016	-.104	-.167
	p-value (N)	.398 (219)	.146 (219)	.027 (213)	.008 (212)	.354 (219)	.007 (211)	.124 (215)	.006 (217)	.949 (219)	.013 (214)	.011 (215)	.812 (219)	.125 (219)	.014 (216)
Total APFT	correlation	-.083	-.077	-.070	-.150	-.026	-.169	-.223	-.028	-.147	-.171	-.017	-.071	-.174	-.197
	p-value (N)	.306 (156)	.341 (156)	.392 (153)	.064 (152)	.743 (156)	.037 (152)	.006 (153)	.732 (154)	.067 (156)	.034 (154)	.837 (155)	.376 (156)	.030 (156)	.014 (155)
Run Time	correlation	.135	.180	.154	.230	.239	.320	.269	.129	.262	.259	.090	.158	.113	.243
	p-value (N)	.086 (163)	.021 (163)	.052 (160)	.004 (159)	.002 (163)	.000 (159)	.001 (160)	.102 (161)	.001 (163)	.001 (160)	.255 (161)	.044 (163)	.153 (163)	.002 (161)
Run Score	correlation	-.233	-.234	-.250	-.209	-.215	-.282	-.275	-.159	-.228	-.249	-.087	-.123	-.139	-.235
	p-value (N)	.001 (196)	.001 (196)	.000 (192)	.004 (191)	.002 (196)	.000 (190)	.000 (192)	.026 (194)	.001 (196)	.001 (191)	.232 (192)	.085 (196)	.052 (196)	.001 (193)
Sit-Up Reps	correlation	.004	-.171	-.039	-.202	-.030	-.257	-.148	-.091	-.153	-.198	-.018	-.070	-.106	-.131
	p-value (N)	.958 (158)	.032 (158)	.631 (155)	.012 (154)	.711 (158)	.001 (154)	.066 (155)	.260 (156)	.055 (158)	.013 (156)	.826 (157)	.383 (158)	.186 (158)	.101 (157)
Sit-Up Score	correlation	-.059	-.205	-.111	-.153	-.063	-.228	-.170	-.048	-.114	-.178	-.011	.022	-.035	-.067
	p-value (N)	.412 (197)	.004 (197)	.124 (193)	.034 (192)	.383 (197)	.002 (191)	.018 (193)	.501 (195)	.111 (197)	.014 (192)	.878 (193)	.755 (197)	.629 (197)	.352 (194)
Push-Up Reps	correlation	-.221	-.236	-.270	-.107	-.031	-.163	-.328	-.169	-.195	-.299	-.100	.157	-.172	-.152
	p-value (N)	.005 (158)	.003 (158)	.001 (155)	.187 (154)	.700 (158)	.043 (154)	.000 (155)	.035 (156)	.014 (158)	.000 (156)	.211 (157)	.049 (158)	.031 (158)	.058 (157)
Push-Up Score	correlation	-.203	-.205	-.231	-.106	-.032	-.159	-.260	-.113	-.146	-.244	-.069	.168	-.024	-.054
	p-value (N)	.004 (197)	.004 (197)	.001 (193)	.142 (192)	.651 (197)	.028 (191)	.000 (193)	.115 (195)	.040 (197)	.001 (192)	.342 (193)	.018 (197)	.736 (197)	.457 (194)

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Table S-6. MALES in FL After 6.2 Mile Road March: Individual Events and Associated TASK Groups with Weight, Height, &Fitness Variables															
		Bucket Fill	Sandbag Stack	FIGHTING POSITION TASK	Balance Beam	Over High Wall	MOUAT TASK	Tire Flip	Skedco Pull	Sandbag Toss	COMBAT TASK	Vehicle Door	Casualty Extraction	Casualty Drag	CASUALTY EVACUATION TASK
Weight	correlation	-.106	-.193	-.194	.115	-.077	.040	.017	-.220	.012	-.100	.030	-.007	-.166	-.102
	p-value (N)	.129 (206)	.006 (206)	.006 (202)	.103 (202)	.270 (206)	.576 (202)	.808 (204)	.002 (205)	.860 (206)	.153 (204)	.673 (204)	.926 (205)	.017 (205)	.148 (204)
Height	correlation	-.162	-.261	-.242	-.079	-.269	-.209	-.118	-.220	-.087	-.193	-.080	.050	-.117	-.123
	p-value (N)	.020 (206)	.000 (206)	.001 (202)	.266 (202)	.000 (206)	.003 (202)	.092 (204)	.002 (205)	.216 (206)	.006 (204)	.256 (204)	.479 (205)	.095 (205)	.080 (204)
BMI	correlation	-.019	-.060	-.069	.173	.063	.163	.089	-.110	.057	.005	.081	-.038	-.113	-.039
	p-value (N)	.783 (206)	.396 (206)	.330 (202)	.014 (202)	.368 (206)	.021 (202)	.203 (204)	.118 (205)	.417 (206)	.938 (204)	.251 (204)	.593 (205)	.108 (205)	.578 (204)
Total APFT	correlation	-.096	-.052	-.058	-.204	.017	-.110	-.053	-.018	-.012	-.026	-.036	.041	-.227	-.159
	p-value (N)	.239 (151)	.529 (151)	.480 (149)	.013 (149)	.833 (151)	.182 (149)	.517 (151)	.825 (151)	.881 (151)	.749 (149)	.666 (149)	.616 (150)	.005 (150)	.053 (149)
Run Time	correlation	.184	.242	.224	.220	.129	.292	.227	.207	.179	.245	.188	-.008	.071	.170
	p-value (N)	.021 (157)	.002 (157)	.005 (155)	.006 (155)	.108 (157)	.000 (155)	.004 (157)	.009 (157)	.025 (157)	.002 (155)	.019 (155)	.916 (156)	.379 (156)	.035 (155)
Run Score	correlation	-.283	-.234	-.283	-.239	-.161	-.320	-.238	-.170	-.159	-.233	-.204	-.007	-.107	-.202
	p-value (N)	.000 (188)	.001 (188)	.000 (184)	.001 (184)	.027 (188)	.000 (184)	.001 (187)	.020 (188)	.030 (188)	.001 (186)	.005 (186)	.928 (187)	.145 (187)	.006 (186)
Sit-Up Reps	correlation	-.092	-.149	-.128	-.084	-.072	-.098	-.070	.061	.004	-.001	-.054	.040	-.087	-.060
	p-value (N)	.259 (153)	.067 (153)	.119 (151)	.302 (151)	.379 (153)	.232 (151)	.390 (153)	.455 (153)	.961 (153)	.987 (151)	.509 (151)	.625 (152)	.284 (152)	.464 (151)
Sit-Up Score	correlation	-.182	-.132	-.169	-.093	-.107	-.133	-.084	.093	-.009	.005	-.100	.050	-.110	-.100
	p-value (N)	.012 (189)	.071 (189)	.021 (185)	.207 (185)	.142 (189)	.072 (185)	.249 (188)	.203 (189)	.899 (189)	.947 (187)	.174 (187)	.492 (188)	.132 (188)	.174 (187)
Push-Up Reps	correlation	-.151	-.172	-.154	.016	-.155	-.076	-.051	.031	-.075	-.003	-.075	.164	-.108	-.074
	p-value (N)	.062 (153)	.033 (153)	.059 (151)	.845 (151)	.056 (153)	.355 (151)	.530 (153)	.705 (153)	.357 (153)	.973 (151)	.361 (151)	.043 (152)	.186 (152)	.369 (151)
Push-Up Score	correlation	-.145	-.152	-.156	-.004	-.149	-.090	-.114	.071	-.047	-.022	-.103	.059	-.072	-.092
	p-value (N)	.047 (189)	.037 (189)	.033 (185)	.961 (185)	.041 (189)	.224 (185)	.120 (188)	.330 (189)	.518 (189)	.768 (187)	.159 (187)	.424 (188)	.324 (188)	.208 (187)

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Table S-7. DAY 1, Soldier's in ACU Performed Each Task Separately in Random Order: Correlation of Field Events with Eachother

		Bucket	Stack	FightPosT ASK	Beam	HighWall	MOUT-TASK	TireFlip	Skedco	SandbagToss	CombatTASK	VehicleDoor	CasualtyExtract	CasualtyDrag	CasualtyEvacTASK
Bucket	Pearson r		1												
	Sig. (2-tailed)														
	N		248												
Stack	Pearson r	.465	1												
	Sig. (2-tailed)	.000													
	N	246	246												
FightPosT ASK	Pearson r	.821	.874	1											
	Sig. (2-tailed)	.000	.000												
	N	241	241	241											
Beam	Pearson r	.000	.085	.043	1										
	Sig. (2-tailed)	.999	.186	.507											
	N	246	244	239	261										
HighWall	Pearson r	.316	.509	.487	.070	1									
	Sig. (2-tailed)	.000	.000	.000	.264										
	N	244	242	237	259	259									
MOUT-TASK	Pearson r	.186	.359	.317	.830	.587	1								
	Sig. (2-tailed)	.003	.000	.000	.000	.000									
	N	246	244	239	261	259	261								
TireFlip	Pearson r	.317	.553	.435	.077	.408	.298	1							
	Sig. (2-tailed)	.000	.000	.000	.221	.000	.000								
	N	242	240	235	254	252	254	258							
Skedco	Pearson r	.298	.552	.469	.079	.422	.290	.611	1						
	Sig. (2-tailed)	.000	.000	.000	.208	.000	.000	.000							
	N	241	239	234	254	252	254	257	257						
Sandbag Toss	Pearson r	.247	.515	.440	.095	.382	.287	.555	.580	1					
	Sig. (2-tailed)	.000	.000	.000	.136	.000	.000	.000	.000						
	N	238	236	231	250	248	250	251	251	253					
Combat TASK	Pearson r	.347	.697	.598	.089	.552	.386	.716	.887	.819	1				
	Sig. (2-tailed)	.000	.000	.000	.154	.000	.000	.000	.000	.000					
	N	245	243	238	258	256	258	258	257	253	262				
Vehicle Door	Pearson r	.153	.218	.163	.052	.222	.172	.448	.285	.372	.308	1			
	Sig. (2-tailed)	.018	.001	.012	.408	.000	.006	.000	.000	.000	.000				
	N	241	240	235	253	251	253	251	250	245	254	257			
Casualty Extract	Pearson r	.172	.298	.264	-.051	.276	.098	.267	.390	.257	.388	-.042	1		
	Sig. (2-tailed)	.008	.000	.000	.422	.000	.123	.000	.000	.000	.000	.508			
	N	240	239	234	252	250	252	250	249	244	253	256	256		
Casualty Drag	Pearson r	.343	.511	.497	.039	.530	.313	.474	.517	.415	.604	.182	.359	1	
	Sig. (2-tailed)	.000	.000	.000	.538	.000	.000	.000	.000	.000	.000	.004	.000		
	N	239	238	233	251	249	251	249	248	245	252	255	254	255	
CasualtyE vac TASK	Pearson r	.331	.545	.499	.035	.528	.314	.551	.581	.486	.656	.316	.509	.909	1
	Sig. (2-tailed)	.000	.000	.000	.585	.000	.000	.000	.000	.000	.000	.000	.000		
	N	240	239	234	252	250	252	250	249	244	253	256	255	254	256

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Table S-8. DAY 1, Soldiers In ACU Performed Each Task in Order through Course: Correlation of Field Events with Each Other

		Bucket	Stack	FightPos TASK	Beam	HighWall	MOUT- TASK	TireFlip	Skedco	Sandbag Toss	Combat TASK	Vehicle Door	Casualty Extract	Casualty Drag	Casualty EvacTASK
Bucket	Pearson r	1													
	Sig. (2-tailed)														
	N	265													
Stack	Pearson r	.448	1												
	Sig. (2-tailed)	.000													
	N	265	265												
FightPos TASK	Pearson r	.812	.800	1											
	Sig. (2-tailed)	.000	.000												
	N	258	258	258											
Beam	Pearson r	.238	.179	.061	1										
	Sig. (2-tailed)	.000	.004	.329											
	N	258	258	258	258										
HighWall	Pearson r	.189	.441	.311	.093	1									
	Sig. (2-tailed)	.002	.000	.000	.138										
	N	265	265	258	258	265									
MOUT- TASK	Pearson r	.333	.358	.218	.867	.491	1								
	Sig. (2-tailed)	.000	.000	.000	.000	.000									
	N	258	258	258	258	258	258								
TireFlip	Pearson r	.354	.621	.547	.319	.329	.405	1							
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000								
	N	263	263	256	256	263	256	263							
Skedco	Pearson r	.292	.677	.590	.128	.394	.307	.635	1						
	Sig. (2-tailed)	.000	.000	.000	.041	.000	.000	.000							
	N	263	263	256	256	263	256	263	263						
Sandbag Toss	Pearson r	.310	.652	.526	.299	.388	.423	.580	.614	1					
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000						
	N	261	261	254	254	261	254	260	260	261					
Combat TASK	Pearson r	.389	.738	.659	.254	.426	.428	.806	.892	.780	1				
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000					
	N	264	264	257	257	264	257	262	262	260	264				
Vehicle Door	Pearson r	.048	.130	.111	.006	.086	.008	.132	.098	.019	.030	1			
	Sig. (2-tailed)	.433	.034	.075	.918	.162	.892	.032	.115	.764	.626				
	N	264	264	257	257	264	257	262	262	260	264	264			
Casualty Extract	Pearson r	.203	.273	.250	.320	.162	.352	.318	.276	.308	.325	.059	1		
	Sig. (2-tailed)	.001	.000	.000	.000	.008	.000	.000	.000	.000	.000	.341			
	N	264	264	257	257	264	257	262	262	260	263	263	264		
Casualty Drag	Pearson r	.337	.519	.479	.161	.303	.271	.468	.653	.464	.636	.135	.108	1	
	Sig. (2-tailed)	.000	.000	.000	.010	.000	.000	.000	.000	.000	.000	.029	.081		
	N	263	263	256	256	263	256	261	261	260	262	262	263	263	
Casualty Evac TASK	Pearson r	.345	.543	.512	.174	.296	.269	.497	.615	.446	.586	.577	.379	.783	1
	Sig. (2-tailed)	.000	.000	.000	.005	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	264	264	257	257	264	257	262	262	260	264	264	263	262	264

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Table S-9. DAY 2, Soldiers In Fighting Load (FL) Performed Each Task in Order through Course: Correlation of Field Events with Each Other

		Bucket	Stack	FightPos TASK	Beam	HighWall	MOUT- TASK	TireFlip	Skedco	Sandbag Toss	Combat TASK	Vehicle Door	Casualty Extract	Casualty Drag	Casualty EvacTASK
Bucket	Pearson r	1													
	Sig. (2-tailed)														
	N	259													
Stack	Pearson r	.524	1												
	Sig. (2-tailed)	.000													
	N	259	259												
FightPos TASK	Pearson r	.796	.911	1											
	Sig. (2-tailed)	.000	.000												
	N	253	253	253											
Beam	Pearson r	.396	.508	.455	1										
	Sig. (2-tailed)	.000	.000	.000											
	N	252	252	252	252										
HighWall	Pearson r	.315	.577	.536	.212	1									
	Sig. (2-tailed)	.000	.000	.000	.001										
	N	255	255	249	248	255									
MOUT- TASK	Pearson r	.436	.716	.634	.695	.745	1								
	Sig. (2-tailed)	.000	.000	.000	.000	.000									
	N	251	251	251	250	247	251								
TireFlip	Pearson r	.379	.595	.597	.251	.376	.441	1							
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000								
	N	251	251	245	244	250	245	251							
Skedco	Pearson r	.421	.716	.678	.311	.519	.610	.615	1						
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000							
	N	253	253	247	246	252	245	251	253						
SandbagT oss	Pearson r	.327	.706	.630	.381	.464	.506	.492	.550	1					
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000						
	N	258	258	252	251	255	250	251	253	258					
Combat TASK	Pearson r	.469	.756	.726	.360	.568	.553	.824	.855	.793	1				
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000					
	N	254	254	248	247	250	248	248	248	253	254				
VehicleDo or	Pearson r	.269	.266	.305	.155	.266	.196	.311	.321	.225	.357	1			
	Sig. (2-tailed)	.000	.000	.000	.015	.000	.002	.000	.000	.000	.000				
	N	255	255	249	248	251	247	247	249	254	253	255			
CasualtyE xtract	Pearson r	.138	.354	.302	.162	.256	.282	.090	.220	.354	.257	.072	1		
	Sig. (2-tailed)	.026	.000	.000	.010	.000	.000	.154	.000	.000	.000	.253			
	N	259	259	253	252	255	251	251	253	258	254	255	259		
CasualtyD rag	Pearson r	.375	.660	.616	.281	.470	.571	.358	.630	.466	.533	.126	.248	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.044	.000			
	N	258	258	252	251	254	250	250	252	257	253	254	258	258	
Casualty Evac TASK	Pearson r	.462	.709	.684	.349	.589	.629	.443	.679	.540	.640	.534	.436	.832	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	256	256	250	249	252	248	248	250	255	254	255	256	256	256

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Table S-10. DAY 3, Soldiers In FL Performed Each Task in Order through Course After 6.2 Road March: Correlation of Field Events with Each Other

		Bucket	Stack	FightPos TASK	Beam	HighWall	MOUT- TASK	TireFlip	Skedco	Sandbag Toss	Combat TASK	Vehicle Door	Casualty Extract	Casualty Drag	Casualty EvacTASK
Bucket	Pearson r	1													
	Sig. (2-tailed)														
	N	239													
Stack	Pearson r	.656	1												
	Sig. (2-tailed)	.000													
	N	239	239												
FightPos TASK	Pearson r	.888	.904	1											
	Sig. (2-tailed)	.000	.000												
	N	235	235	235											
Beam	Pearson r	.475	.549	.494	1										
	Sig. (2-tailed)	.000	.000	.000											
	N	235	235	235	238										
HighWall	Pearson r	.477	.608	.596	.263	1									
	Sig. (2-tailed)	.000	.000	.000	.000										
	N	235	235	231	234	239									
MOUT- TASK	Pearson r	.596	.764	.708	.796	.713	1								
	Sig. (2-tailed)	.000	.000	.000	.000	.000									
	N	233	233	233	233	230	233								
TireFlip	Pearson r	.368	.601	.533	.405	.592	.608	1							
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000								
	N	232	232	229	232	234	229	235							
Skedco	Pearson r	.456	.525	.527	.441	.367	.565	.465	1						
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000							
	N	234	234	230	230	233	229	232	234						
Sandbag Toss	Pearson r	.394	.479	.477	.313	.526	.590	.576	.396	1					
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000						
	N	237	237	233	233	234	231	231	233	237					
Combat TASK	Pearson r	.533	.727	.690	.538	.599	.750	.835	.765	.713	1				
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000					
	N	235	235	231	231	232	231	230	231	233	235				
Vehicle Door	Pearson r	.290	.326	.335	.209	.363	.348	.479	.297	.907	.326	1			
	Sig. (2-tailed)	.000	.000	.000	.001	.000	.000	.000	.000	.000	.000				
	N	237	237	233	233	233	231	230	232	235	235	237			
Casualty Extract	Pearson r	.161	.286	.247	.174	.181	.246	.174	.251	.186	.271	.039	1		
	Sig. (2-tailed)	.013	.000	.000	.008	.006	.000	.008	.000	.004	.000	.556			
	N	236	236	232	232	233	231	230	232	234	233	234	236		
Casualty Drag	Pearson r	.384	.481	.467	.378	.407	.494	.519	.635	.398	.593	.200	.200	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.002	.002		
	N	235	235	231	231	232	230	229	231	233	232	233	235	235	
Casualty Evac TASK	Pearson r	.451	.687	.619	.455	.542	.659	.642	.663	.590	.723	.540	.465	.731	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	236	236	232	232	233	231	230	232	234	235	236	234	233	236

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Table S-11. 6.2 Mile Road March Time Correlated with Height, Weight, and APFT Variables

		Weight	Height	BMI	APFT Self- Reported	APFT Recalculated	2 Mile Run Time Self- Reported	2 Mile Run Score Recalculated	2 Mile Run Score Combining Self Report + Recalculated	Push Up Reps Self- Reported	Push-Up Score Recalculated	Push-Up Score Combining Self Report + Recalculated	Sit Up Reps Self- Reported	Sit-Up Score Recalculated	Sit-Up Score Combining Self Report + Recalculated
Road March	Pearson r	-.257	-.321	-.101	-.106	-.114	.405	-.101	-.100	-.345	-.061	-.070	-.213	-.220	-.165
Time:	Sig. (2-tailed)	.000	.000	.114	.151	.131	.000	.173	.137	.000	.415	.296	.004	.003	.014
ALL	N	246	246	246	184	178	187	185	222	182	180	223	181	179	223

Table S-12. 6.2 Mile Road March Time Correlated with Task and Associated Individual Events (Day 3, after Road March)

		Bucket Fill	Sandbag Stack	Fighting Position Task	Balance Beam	Over High Wall	MOUT Task	Tire Flip	Skedco Pull	Sandbag Toss	Combatives Task	Vehicle Door	Casualty Extraction	Casualty Drag	Casualty Evacuation Task
Road March	Pearson r	.351	.467	.467	.268	.256	.347	.389	.263	.266	.388	.208	.091	.241	.304
Time:	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.169	.000	.000
ALL	N	232	232	228	228	228	226	225	227	230	228	230	230	229	229
Road March	Pearson r	.182	.352	.310	.140	.088	.174	.284	.118	.173	.231	.078	.056	.181	.184
Time:	Sig. (2-tailed)	.010	.000	.000	.050	.217	.015	.000	.096	.014	.001	.276	.435	.010	.009
MALES	N	200	200	196	196	200	196	198	199	200	198	198	200	200	198
Road March	Pearson r	.260	.082	.218	-.013	-.017	-.137	-.006	-.011	.338	-.097	.390	-.338	-.300	-.302
Time:	Sig. (2-tailed)	.150	.656	.231	.944	.930	.470	.978	.955	.068	.611	.027	.068	.114	.098
FEMALES	N	32	32	32	32	28	30	27	28	30	30	32	30	29	31